THE GRAY SHEET

Computer Industry

REPORT

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REPORT

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"IBM's ES/390 strategies are among the company's most obvious account control maneuvers in years."

IBM to 3090 Base: You Don't Need Oxygen Masks for Summit

In the relatively stable mainframe world, among the biggest challenges facing IBM is how to encourage customers to adopt new technologies. Each change impacts systems, databases, networks, applications, and personnel. As topologies become more complex and strategic, the disruptions carry greater risks and costs.

Nevertheless, as capacity limitations are neared, installations must evolve. IBM's recent strategy has been to "bridge and grow" by providing incremental steps to new performance levels and functions. Many of the improvements targeted I/O throughput, because pulling data off of mechanical devices and transferring it to semiconductor memory has been the single greatest bottleneck. Competitors labeled the strategy everything from "announce and freeze," to "bait and switch," and even "grovel and lie." But, disparaging remarks aside, gradual improvement has served IBM and its customers reasonably well during the life of the 3090. Fully half of IBM's U.S. mainframe revenue is currently derived from hardware upgrades.

However, for some months now the market has expected a new hardware platform — known as Summit — capable of providing new functions, and of serving as IBM's performance hammer against plug-compatible-manufacturer (PCM) competitors. The constraints of servicing the installed base make IBM's strategies for transitioning customers to Summit as important as the attributes of the machine itself. Now that Summit is announced in the form of the ES/9000 machines, two general comments can be made:

- **From a bridge-and-grow standpoint, Summit is well conceived and executed.** Upgrade schedules are flexible and priced to compel migration. The new functions announced, generally speaking, satisfy many customer "must haves." IBM has done an excellent job of identifying technical and financial adoption barriers, and of crafting strategies surrounding the ES/9000 offerings to minimize treks to the new machines.

- **From a performance standpoint, only the middle of the ES/9000 can be regarded as a hammer,** at least in the near term. The two highest performing ES/9000 models won't ship until mid-1991. The high-end ES/9000s that are ready to ship offer performance parity with the ES/3090J machines. Midrange ES/9000 machines ready to go in the fourth quarter, however, offer significant performance boosts over 4381s. In the longer term, PCM's technology improvements should continue to press IBM's capabilities on a unit-to-unit MIPS comparison.

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IBM's ace-in-the-hole is that, by controlling architectural directions, it can significantly influence just what constitutes a "unit-to-unit MIPS comparison." For the most part, IBM has followed recent tradition in targeting its functional enhancements at improving I/O availability, security, and throughput, as well as configuration flexibility. Capacity can now be added horizontally as well as vertically through a high-performance clustering capability. Moreover, they are distinguished by "non-disruptibility," or the characteristic that they can be introduced into systems which can be reconfigured without incurring tremendous downtime.

IBM's fourth quarter will receive a boost from this announcement for two reasons. First, the market had frozen in anticipation of Summit; customers should now have enough information to make a decision. Second, although many users will likely decide to wait until all ES/9000 models are shipping, we expect that IBM will be able to generate significant upgrade business among its lower-end 3090 and midrange 4381 customers.

The importance of the ES/390 family should not be underplayed, either to high-end customers or the market at large. Using architectural weapons, IBM has launched a full-scale attack. The breadth and scope of this assault will likely have tremendous long-term consequences for the market. We believe that over time battles for mainframe market share will be less centered on capacity additions, and more on control of the site. If anything can be said about IBM's ES/390 strategies, it is that they are among the company's most obvious account-control maneuvers in years.

Moreover, IBM's new machines raise the ceiling on commercial-processing capabilities in general. Although price/performance issues will always play a critical role in industry directions, the functions embodied in Summit will redefine positioning across all price and performance classes.

Functional Overview

MVS/ESA was a strong first wave of attack on I/O performance and availability. ES/390 is an even more effective second wave. The new functions introduced with the ES/390 greatly increase processing availability and flexibility without incurring additional integrity and reliability risks. Installations can now be enhanced not only through vertical upgrades, but through horizontal additions of capacity as well. The costs of changing site configurations have been greatly lessened. Customers with large or small S/390 installations will be in a better position to assemble the most productive combination of hardware, software, communications, and applications resources.

However, if IBM's goal is to enable customers to use technology to build and support increasingly complex information systems, the company must do a better job of delivering productivity tools for systems management. We are very disappointed that IBM is effectively retreating on its commitment to bring forth a comprehensive framework for managing computing resources. The range and reach of computers should extend not only outward into enterprises, but inward into the organizations responsible for executing information systems strategies and operations.

Not All ES/9000s Are Created Equal

IBM introduced eight new water-cooled mainframes based on the 3090-J 22MIPS uniprocessor. These models offer the same engine performance (MIPS) as comparably-

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Product Specifications and Upgrade Routes for the ES/9000

(Source: IBM, International Data Corporation, 1990)

Water Cooled

Model	Type	Availability	3090J Equivalent	Estimated MIPS	Upgradable To:
330	Uni	9/90	170J	15.3	500
340	Uni	9/90	180J	22.2	500
500	Dyadic	9/90	200J	43.5	580, 620
580	Triadic	9/90	300J	62.2	620, 720
620	Four way	9/90	400J	79.6	720, 820
720	Six way	9/90	600J	112.5	900
820	Four way	3Q/91		145.3	
900	Six way	3Q/91		202.5	

Air Cooled

Model	MIPS	Availability	# CPs	Upgrade Path to	Packaging
120	2.0	2/90	1	130	Rack-mounted
130	N.A.	12/90	1	150	Rack-mounted
150	N.A.	12/90	1	170	Rack-mounted
170	8.0	4Q/90	1	210, 260	Rack-mounted
190	8.0	3/91	1	210, 260	Frame-mounted
210	N.A.	1/91	1	260, 320	Frame-mounted
260	18.0	9/90	1	320, 440, 480	Frame-mounted
320	22.0	9/90	1	440, 480	Frame-mounted
440	34.0	3Q/91	2	480	Frame-mounted

configured Js. The 720, a 600J transplanted into an ES/9000 frame, has the same MIPS rating (112.5) as the 600J. These "hybrid" models, a combination of 3090-J and ES/9000 technology, will be available immediately. Virtually all of the hybrids have the same memory and channel limitations as the comparable J models.

In contrast, the thoroughbred ES/9000 models support up to 1GB of main memory, to 8GB expanded and to 256 channels. The high-end models, 820 (145MIPS) and 900 (202.5MIPS), utilize a new 40.5MIPS uni and a completely new internal organization. These "thoroughbred" models will not be available until 3Q/91.

IBM claims that the ES/9000 water frames offer 16% to 20% better price/performance (base CEC configuration list price) than comparable 3090-J models. Price/MIPS of the new models is approximately $100,000 to $115,000 a significant reduction from the 3090-J price/MIPS of $120,000 to $140,000.

The price for ES/9000 memory is $4,000/MB. This is a 35% reduction from the previous 3090-J memory price of $6,125/MB (models 200J and above). IBM is also announcing significant memory price cuts on 3090J main and expanded storage.

At the Core of S/390

Eight new functions enhance I/O throughput, availability, security, and flexibility of the ES/390 relative to previous generations of IBM mainframes.

- **Enterprise Systems Connection Architecture (ESCON).** ESCON supports fiber-optic channels and embodies a new architecture at the I/O subsystem and channel level (replacing the OEMI interface) that enables nonsynchronous operation and nondisruptive device attach.

- **System Complex (Sysplex).** Up to eight processing images now can be unified and managed as a single, highly availa-

ble, centrally controlled processing "ring" of channel-to-channel connections.

- **PR/SM Extended Recovery Facility.** Sysplex domains are logically defined. A Sysplex image could be constructed on a single machine (synchronized by its own TOD clock) running eight separate PR/SM domains. Thus, the failover capabilities of Sysplex can be exploited on a lone machine with PR/SM.

- **Assists for DB2 Sort.** The ES/390 instruction set includes two new assists for sorting DB2 data. These instructions were designed specifically for DB2 because IBM's strategic large-systems relational database manager performs sorts independently of DFSORT.

- **Integrated Cryptographic Processor.** To harden I/O security without incurring significant processing overhead, the ES/390 architecture has been extended to include a new integrated cryptographic processing capability.

- **VM Data Spaces.** A large number of new operating system functions, previously available only to MVS users, can now be utilized by VM. Like MVS/ESA, VM data can be located in an ESA data space and shared among numerous processes without compromising integrity.

- **Dynamic Relocation.** In conjunction with the dynamic device-attach capability provided by ESCON, the "Hardware Configuration Definition" (HCD) feature allows dynamic changes to I/O hardware and software. Dynamic reconfiguration management basically obviates the need for planned downtime to change I/O structures. Additionally, I/O gens are eliminated.

- **Console integration**. Under ES/390 services, the hardware console can be used as an operator's console, taking a step towards simplifying the administration and operation of complex large systems.

Of the new functions, five are backward compatible to the J models: ESCON, Sysplex timer, DB2 Assist, Cryptographic feature (through an RPQ), and PR/SM XRF. The other three are supported on the ES/9000s only.

ES/390 Operating Systems

MVS/ESA 4 is distinguished by two features. First, it runs on all ES/370 models, including the 4391 Es and ES/3090-S machines. Second, migrations to the new version should be even simpler than the move to MVS/ESA 3.

The new MVS fully exploits all the core functions, including ESCON, dynamic reconfiguratio,n and Sysplex/XCF. It boasts of a new integrated Advanced-Program-to-Program Communications (APPC) LU6.2 capability which enables much more efficient communications between MVS-resident programs, as well as programs cooperatively processing between nodes. Programs that involve transactions more complex than normally associated with subsystems like CICS, or characterized by uncertain scheduling requirements, can be efficiently executed with high integrity using APPC/MVS.

VM/ESA is improved in two primary areas: using the data-spaces capability, each virtual machine has access to over 1,000 2GB addressable objects; and ESCON is operational in VM environments.

VSE/ESA signals the end of IBM's reluctance to enhance VSE. As currently positioned, VSE/ESA is the favored S/390 platform for midrange (either standalone or distributed) transaction processing. IBM insists VSE/ESA will run for now and forever only on uniprocessors, defined either physically or logically.

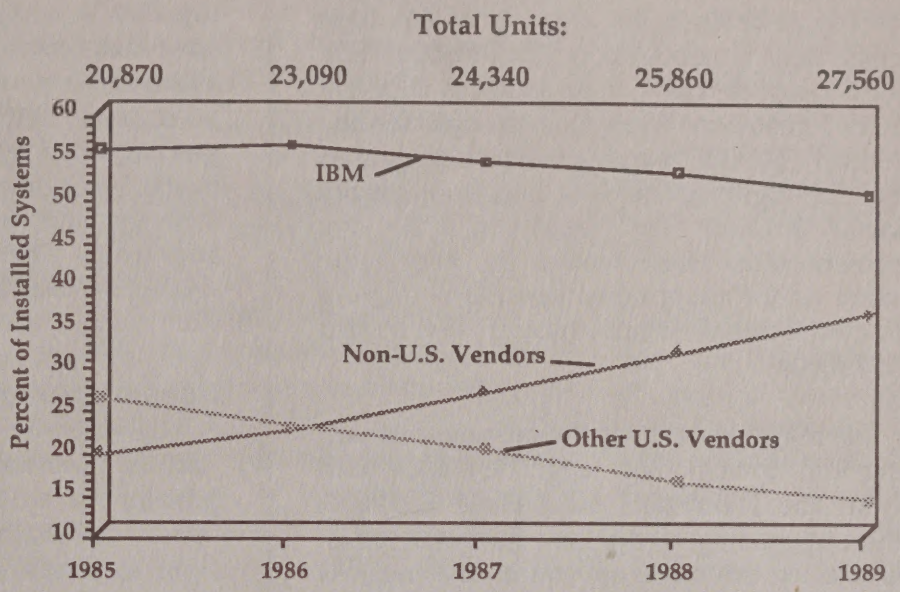
ES/390 Software Subsystems

The new ES/390 functions enable IBM to improve data management and security,

among other system capabilities.

A new release of DB2 supports IBM's Distributed Relational Database Architecture. Whereas DB2 2.2 included the capability to perform remote units of work between different DB2 databases, DB2 2.3 begins the trek towards any-to-any distributed database access by allowing a DB2 database to transparently connect to an SQL/DS database using the features of remote units of work.

Worldwide Installed Base of Large-Scale Systems, 1985-1989
(Source: International Data Corporation, 1990)



ES/390 security is greatly enhanced by the addition of the Integrated Cryptographic Feature (ICF). The ICF can encrypt and decrypt large volumes of data without overwhelming throughput. MVS/ESA and ICF should provide the necessary functions of message-level encryption and secure, encapsulated hardware to meet the DoD B1 level security rating.

The Are-These-"True"-Summits? Argument: a Moot Issue

Obviously, the ES/9000 hybrid models borrow heavily from 3090J technology and design. The thoroughbred models represent the type of significant new technology and design customers have always associated with moving to a new mainframe generation.

Does this mean that customers should ignore the hybrid ES/9000s, and wait for "real" ES/9000 mainframes? Is the introduction of the hybrid ES/9000s some sort of sinister IBM strategy to trick customers into staying with IBM and ignoring the PCMs?

We believe very few customers will be concerned about whether the hybrid models represent the fullest implementation of the ES/9000 technology and design. We feel that the typical 3090J customer decision whether or not to move to the ES/9000 will simply revolve around whether the customer needs more horsepower, and was likely to consider a J-to-J upgrade.

For example, a 3090-200J customer needing more capacity will now take an upgrade to an ES/9000-580 — at a price about 5% less than what the 200J-to-300J upgrade would have cost. The customer goes from the 200J to a machine with performance equivalent to a 300J, but offering some ES/9000 components (power supply, frame and covers) making the eventual transition to thoroughbred 9000s a little less dramatic.

A year or two later, when more capacity is needed, the customer will likely be offered an upgrade from the hybrid ES/9000 mainframes to another, as-yet-unannounced series of ES/9000 kickers, based on an improved version of today's thoroughbred ES/9000 processor.

Benefits of the Two-Step Approach

In terms of cost, the swap versus upgrade choice is likely to be a marginal factor in customers' acceptance of the 3090J-to-ES/9000 upgrade path. Our guess is that if a 3090-J customer were able to wait for the hybrid ES/9000 mainframes to be replaced by thoroughbred models, and then simply swap out for the "real" ES/9000, the present-value cost would be about the same as (or marginally less than) moving in two upgrade steps through the hybrid ES/9000s.

The major benefit for the customer of taking the incremental, upgrade-based path from the J through the hybrid ES/9000, then upgrading to the next ES/9000 series, is exactly the same as one of the benefits for IBM: the customer can spread the cost (and thus IBM can spread the revenue) of moving to thoroughbred ES/9000s over two jumps rather than one. It allows the customer to buy capacity — and new function — in smaller bites, matching capital expenditures more closely to capacity requirements (instead of overbuying capacity). Does this sound familiar? It should: it is simply a continuation of what IBM (and its customers) have been doing since the introduction of the 3090E series!

Are the Hybrids "Real" ES/9000s? Does Anyone Care?

Therefore, asking whether the ES/9000 Models 330 through 720 are "real" ES/9000s is like asking, in 1987, whether 3090-Es were the full implementation of the ultimate 3090 technology and design. Likewise, wondering whether 3090-J customers should ignore the hybrid ES/9000 mainframes and wait for the next ES/9000 series, is like asking in 1987 whether 3090 base customers should ignore the E series and wait for the 3090-S. In the upgrade-oriented IBM mainframe world, a strategy based on waiting for the ultimate implementation of a family's design and technology is as pointless as waiting for Godot.

This doesn't mean that customers should blindly choose an upgrade whenever more capacity is needed. As the past five years have demonstrated, there are often viable alternatives to an IBM upgrade: PCM systems, used IBM and PCM systems, or upgrading used systems. Customer decisions in the 3090 generation have been based on capacity and functional requirements — and price. The 3090J-to-ES/9000 decision should be based on exactly the same criteria.

Communication Systems Implications

IBM's commitment to fiber channel support for three different communication systems — 3745, 3174, and 3172 — offers insight to IBM's strategy for addressing the increasingly complex networking question. Each of these systems will serve as a gateway into unique environments.

The "division of labor" among the three will broaden IBM's customers' options in addressing the issues of protecting investment and distributed computing. Broadening the options, however, will also increase the importance of network management and system administration.

Network Management

Support for multiple types of network environments, from simple terminal-to-host networks to enterprisewide multi-vendor client/server networks, calls for a flexible management strategy. It demands integrated system and network managements. The introduction of NetView Version 2 and SystemView, IBM's systems management architecture is a pivotal step in that direction.

NetView

As expected, NetView Version 2, scheduled for availability in two releases, begins to distribute network management intelligence among network nodes. Its key feature is support for LU6.2 (available in

1991), a transport connection for peer-to-peer computing. NetView, with LU6.2 support, will exploit the intelligence of network management devices operating within the network. In addition, LU6.2 support will allow users to distribute the processing required to run NetView across the network.

NetView Version 2 will also include a CUA-compliant graphics monitor running on an OS/2-based workstation. This monitor will merge with the existing DOS-based NetCenter interface into a single application by mid-1991.

SystemView — Shortsighted?

SystemView is IBM's architecture for enterprise management — including systems, network, and applications management. The SystemView announcement displays IBM's commitment to supporting multi-vendor, peer-to-peer networking and distributed computing as well as to continue supporting traditional terminal-to-host environments. The announcement also highlights the requirement for an enhanced systems management architecture.

However SystemView, as currently conceived, is the single largest disappointment in this announcement. Although generally regarded as among user's highest priorities, the directions IBM appears to be taking with systems management tools reflects a retreat from earlier, and very grand, promises.

With the announcement of AD/Cycle, IBM promised to integrate a model for operations into the repository structure. Since, however, IBM's systems management experts have determined that the volumes of data and performance requirements of systems management software are too great for the current implementation of Repository Manager/MVS. Although SystemView covers all the necessary dimensions of problem determination and management, change management, configuration management, and performance and accounting management, it does so using a structure that is largely independent of the existing repository definition.

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The *Gray Sheet* expects that the first set of systems management applications will be extensions to IBM's Automated Console capability. This approach is consistent with IBM's introduction of NetView. In the initial NetView release, IBM introduced a network management strategy initially supported by existing network management products: Network Communications Control Facility (NCCF), Network Problem Determination Application (NPDA), and Network Logical Data Management (NLDM). Today, these products constitute the core functionality of NetView.

Taken together, IBM's SystemView and NetView announcements communicate an understanding that network management increasingly requires integration with system and application management. Indeed, other vendors such as DEC and Hewlett-Packard included system management as integral components of their network management strategies from the outset. IBM, in taking an opposite approach, may face difficulties in retrofitting its network management product into its enterprise management strategy despite the fact that NetView has a high level of market penetration. Customers that wish to pursue IBM's directions will not easily be able to integrate the functions and data of application development and systems management. Over time, as the performance of the repository is improved, IBM claims it will merge its different metadata frameworks together.

F Donald Bellomy

Data General has laid off more than 2,000 employees, but not all the bad news comes from Massachusetts. National Semi also has announced 2,000 layoffs, and has shut down two plants. Over the past five years, DG has decreased its work force by over 40%.

IBM hopes the new low-end AS/400, model 9402, will entice the S/36 base with its much lower entry price. IBM claims that over 30% of AS/400 sales are to accounts with more than one AS/400. No high-end kickers were announced. IBM also increased prices on a broad range of products, but not 3090s, PS/2s, or anything nnounced since June.

Wang won a five-year, $841 million U.S. State Department deal. Just about everything Wang makes is in the contract, but, since the RFP came out in 1987 (actually '85 but modified in '87), the win is not a ringing endorsement for Wang's Unix systems, but is instead biased towards older proprietary systems. Wang's winning edge proved to be the huge installed base of Wand hardware and software at State, which had accrued thanks to two previous agreements dating back to the mid-eighties.

Fujitsu has promised Unix V.4 for its M 7x0 mainframes and new VP supercomputer by next April. Its V.4 will be compliant with Posix and X/Open's standards and will make use of the latest X/Window system.

Fujitsu America will export to Japan. Communication control processors (CCPs), used to monitor and control traffic between its mainframes and manufactured in the company's Hillsboro, Oregon complex along with point-of-sale (POS) terminals, will be sold as a part of the Atrium9000 POS system being marketed by Fujitsu Systems of America (FSA) in the U.S. Back at home, Fujitsu Limited expanded the mid-range of its 2400/40 and 2200/40 supercomputer lines.

Just one month after Digital begins shipping its first fault-tolerant system, the company introduced a new server model last month for the VAXft 3000 line aimed at telecommunications and process control markets. Digital also slashed 3000ft prices by 27%.

Prime has extended its EXL Unix line with four MIPS RISC systems. Prime will try to avoid fighting it out in the whose-commodity-minicomputer-can-run-Oracle-faster? market by aiming at the Pick market. Having little success with a similar strategy on OEMed Sequent machines, Prime has decided against an exclusively Intel-based Unix/Pick line. The Intel-powered low-end EXLs comprise less than 15% of Prime's computer sales.

Bull will purchase Honeywell Federal Systems in a move which finally relieves Honeywell Inc. of its last vestige of computer systems business.

Cray Research has agreed to settle a 1989 shareholder lawsuit for $700,000. The case was a consolidation of three separate cases claiming failure to make public certain financial information and prospects regarding future business. Cray felt the case is without merit; however, the company said it would agree to settle in the interest of saving time and money in litigation.

Other notes: IBM transferred control of key business segments to selected managers in West Germany, France, Britain and Italy. MIPS' executive marketing VP Chuck Boesenberg was promoted to president. Intel delivered iWarp microprocessors to Carnegie Mellon, its parallel computing partner. Sounds "high trek."

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Channels, Integration, Obsolescence, and Inflexibility — Four Dark Horsemen of the PC Industry

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Worldwide Growth Slows, Even — Especially — in the United States

Across the computer industry — from mainframes to personal computers — growth rates are on the decline. And the competition is getting fierce. At the high end, the largest beasts are locked in mortal struggle for tiny pieces of the barely growing pie. In the decimated midrange, skeletons of companies circle and stalk each other as the market slowly shrinks.

Personal computer companies hover on the periphery like jackals. Quicker and more nimble than older, larger foes, they're a threat to dart in and steal a chunk of market-share bounty. Their key advantages — speed, stealth and size — have always provided opportunity to increase their take.

But, of course, this scenario is only half true. Even life on the periphery is not independent of greater environmental forces. The PC industry's health rests not only on entry into new vertical applications, but also on the continued growth of traditional personal computing markets. Therein lies the problem — both new and traditional PC markets appear to be waning.

Popular thinking formerly held that PC markets were capable of perpetual expansion. And that PC vendors were assured of

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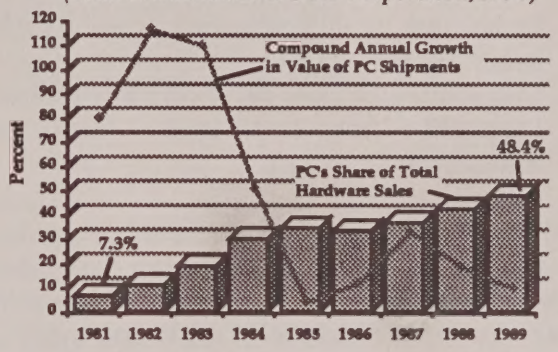
Despite Slowing Growth, PC's Still Making Inroads on Installed Base

(Source: International Data Corporation, 1990)



almost perpetual vitality. They were driving downsizing. They were supposed to be the primary beneficiaries of fundamental changes in state-of-the-art computing.

Apparently it's time to rethink some of these assumptions. Amid a deepening worldwide recession, PC markets are increasingly described with words like maturation and consolidation. Consider these downsides:

- **Worldwide growth is down** into the very earthly 12-14% range. While 1984's precipitous drops in PC unit shipment and revenue was worse, the fantastic growth which dominated the past decade is gone.

- **The U.S. PC market leads the decline.** Shipments of PCs to the U.S. grew only 4.3% between 1988 and 1989. The value of shipments increased by 9.9%. The U.S. market is not expected to grow at more

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than 8% in units or 11% in value in any year over the next five years.

- **Only small regional markets are showing the vitality usually associated with the PC.** Japan and the rest of world — (ROW), primarily Latin America and the rest of the Pacific Rim — are hitting high gear with growth rates over 30%. But these regions, combined, account for less than 20% of all installed PCs worldwide.

- **A product cycle changeover is, again, responsible for the PC doldrums.** While 80286 availability problems were largely responsible in 1984, no such hardware shortage exists today. Instead, the brutally tedious evolution away from DOS is breeding serious questions about migration strategies and the ability to produce innovative new applications from the maxed-out DOS base.

But wait, all is not lost. Personal computer markets still remain the healthiest computer hardware markets. Those 12-15% growth rates are still double total multiuser system sales growth rates. Sure, the fantastic growth which dominated the past decade is gone, but nothing lasts forever.

And, in fact, there is cause for some optimism. The basic conditions which drove PC sales at double-digit rates over seven of the last ten years still obtain. To wit:

- **In spite of the consolidation myth, hundreds of small companies still drive PC innovation.** Personal computer markets are still attracting new entrants, not contracting (see Niches, p. 12). No other industry is driven by such a broad base of innovation.

- **Microprocessors are still setting price/performance improvement standards.** Just look at the sheer performance of the '486 or any one of the handful of RISC chips flooding the market. Historically, the performance gap between what's necessary for yesterday's applications and what sits on the desktop creates applications, and markets.

In addition, even maturing markets can spawn new opportunities:

- **Mobile PC sales growth is driving the market.** A new dynamic is stealing PCs off the desktop and into palms, laps, and briefcases. In 1990 approximately 11% of U.S. PC sales will be mobile PCs. An upcoming ***Gray Sheet*** will revisit the mobile market.

- **Replacement is the byword of the '90s.** And of the 80386, the SXs and DXs and the '486s and up. Who cares about the PC-to-white-collar-workers ratio when the simple replacement of an old 8088 IBM PC with a networked '386SX clone with Windows and Notes provides such a quantum performance leap?

- **Server hardware and software really is increasing networked-PC functionality.** Someday we'll really be able to say that networked PCs are stealing small- and medium-scale systems sales from the mini vendors. Mail-order office automation systems might not be farther than a phone call away (see "PCs in Mini Land," p.10).

So, what about this saturation routine? Have PCs truly reached a penetration plateau? Or, is the cyclical nature of the PC industry, one that remained hidden behind yesteryear's double-digit growth, only now coming clear? What is the underlying cause of the low-end gloom?

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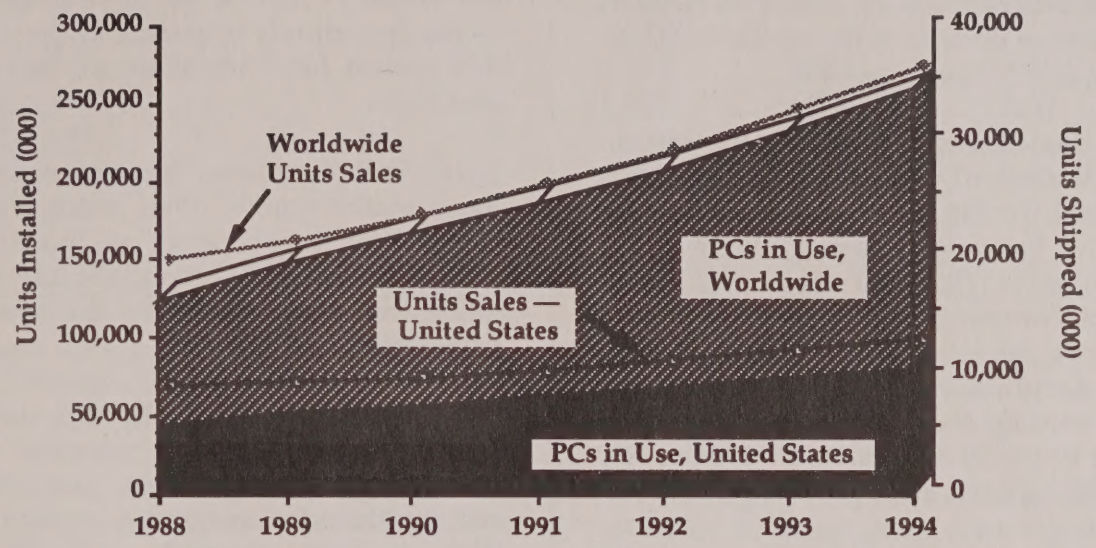
Worldwide and United States Personal Computer Units Shipped and Installed, 1988 - 1994

(Source: International Data Corporation, 1990)



The answer seems to be that **the genius of the personal computer genesis has been diluted by its own success.** A variety of reasons now prevent PCs from penetrating beyond the 50%-of-white-collar-workers barrier. They are quelling users' desire to absorb more PCs, and inhibiting vendors' abilities to drive hardware sales. The factors can be grouped, broadly, in four categories:

- **channels dilemmas**
- an array of product **standards, life cycle and obsolescence** issues,
- **vendor inflexibility** and inability to change
- and the **integration** of PCs into existing MIS structures and systems.

More directly, PC-market ennui can be traced to this simple fact: **DOS can no longer drive the industry forward and nobody wants to believe the party's over.** Despite ever-steepening price/performance curves, despite breakthrough entry-level price points, red hot technology isn't good enough, given the PCs' flashy past. To reach those rates again, the industry needs to realign around today's market realities. The days are marked for sales and support systems of the past.

But success (read also "dollars") breeds institutional contempt for change. And we're seeing that IBM isn't the only bureaucracy in the computer market.

Does the PC industry believe enough of what it says — about flexible organizational structures, about enterprises in constant motion, about perpetual regeneration and competing in lightning-fast high technology markets — to transform itself? If history is any indication, a look back and up at the midrange companies shows the answer is probably not.

Factors Constraining Demand

Personal computer malaise didn't happen overnight. By and large it is the result of the astronomical expectations generated by its own success. The inflexibility of PC compa-

Continued on page 7

The World According to Compaq

Compaq Computer Corp.'s President, North America, Mr. Michael Swavely, paid a recent visit to IDC. Herewith are some of his views on the state and direction of the worldwide PC industry, and Compaq's role in it.

How does Compaq measure PC saturation? We see all white collar workers as a potential market opportunity. So far the industry has only achieved 30-35% penetration in the U.S., and about 10% below that in Europe. What's interesting is that we don't expect to see saturation for another decade since replacement rates, running around 15-20% this year, will increase to the 40-50% range by 1994 or '95, stimulating even more growth.

Is the PC market mature? That's not the point. The booming success of 1980s PC markets were driven almost exclusively by personal productivity software. Starting with the 80386 in 1986, hardware capabilities grew well beyond personal productivity applications. That's changed. Now, driven by increased hardware capabilities at lower price performance versus the alternatives, PC CAD comprises three-fourths of all CAD/CAE unit sales. PC Unix systems far outsell other Unix boxes. Network server sales are dominated by PCs.

The question becomes, then, Is the term "personal" still applicable and accurate for these products and markets? And the answer is "Not really." PCs are moving beyond a personal productivity orientation to multi user, or specialized technical, applications. And that trend is accelerating. Take the SystemPro. It's appearance means PCs can now deliver the performance of minicomputers and mainframes. So the benefits associated with traditional PC markets — low price/performance, open standards, mass distribution channels, for example — will become available to users in those markets. Our current thinking is personal productivity enhancement products will remain at least half of the overall PC market for another decade — the opportunity to pursue system sales will remain incremental for at least that time frame.

What does that mean for companies in those markets now? Well, among other things, you might expect all those size-class distinctions to blur and the only definition that remains will be the open or proprietary question.

How does Compaq fit in? Pretty well. A solid distribution system means at least three things: good products, good prices and multivendor integration capabilities. With our strong channels we've allowed people to select the very best hardware, software and peripherals, regardless of vendor, and then have the dealer put it all together. That's what we call the unbundled approach and it's in direct contrast with the minicomputer and mainframe vendors' approach. What's interesting is that customers, very clearly, are demanding the unbundled approach because the price differential between minicomputer and PC systems is so great. Customers will pay for service and support, but they want to choose, and they want to know the price. You don't get either of those too often, with the older systems companies, because they bundle their products.

Also, their expenses (G&A, R&D, selling) are running at 40% of revenue which pushes up their prices. We've got half the overhead, and we've got just a tiny portion of the infrastructure. So while they have to figure out ways to cut costs, ours are already low. And it's largely due to the indirect sales channel.

But those systems sales are going to get pretty complex. Won't you have to build

Continued next page.

1989 Worldwide Intel-based Personal Computer Shipments

(Source: International Data Corporation, 1990)

Processor	United States	Western Europe	Japan	Rest of World	Worldwide
8088/86	1,830	1,490	134	952	4,405
80286	4,072	2,450	1,204	1,077	8,802
80386SX	503	242	57	42	844
803386	1,386	677	261	217	2,541
80486	2	0	0	2	4

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at least some part of that infrastructure? No. Our commitment to this structure is a major strategic decision, and a critical one. It's not a quarter to quarter, or even a year to year issue, but a five to ten year issue. User expectations for mission critical applications have been set by the older systems companies. So, for experience users look backwards. And those expectations are not going to change overnight, but in a matter of years. Meanwhile, dealers will be building support capabilities to meet new customer expectations. The intersection of those two rates will happen in the next couple of years. Until then, there's going to be some level of disconnect. And that doesn't make me happy, but I'm talking about long term directions. To try to force that is, in fact, to put Compaq in the position of the older systems companies. From a financial and business strategy that doesn't work. This strategy may cause some short term problems. Some customers are experiencing problems right now. That's unfortunate but that's reality. It will also change. Not this quarter or next quarter, but it will change.

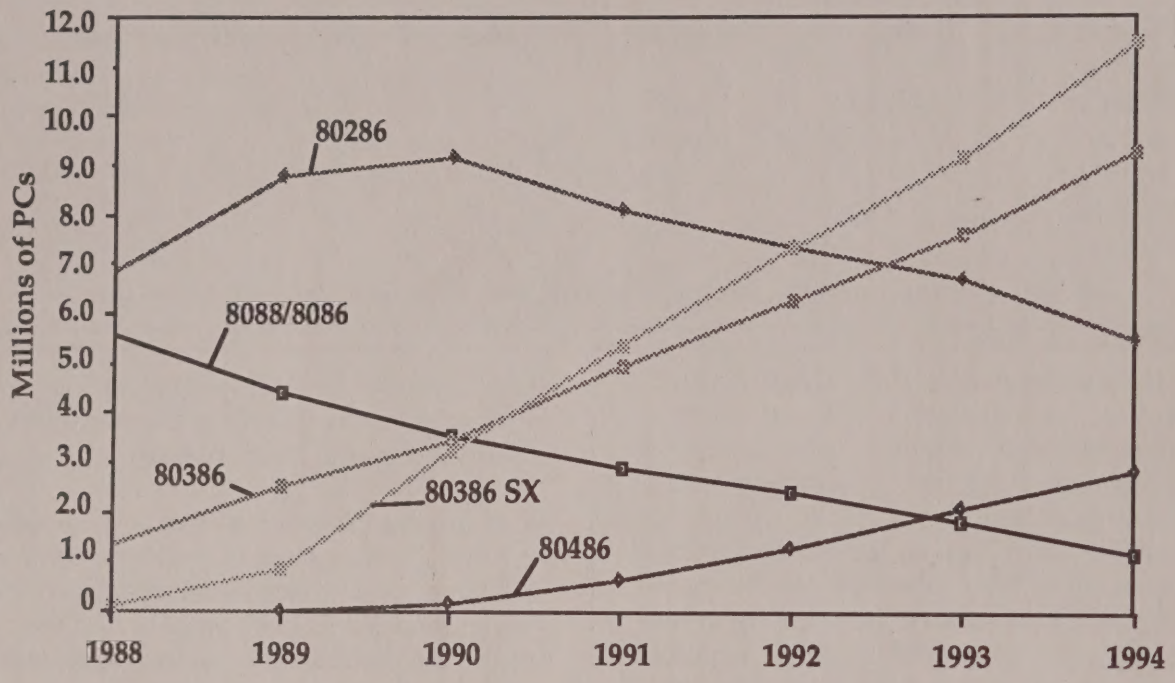
How will Compaq assist the dealers in making that transition? Again, it's a slow building process, but there are basically three approaches: to help dealers build capabilities internally, to help dealers get together with other resellers that already have some of those capabilities, and to work with consultants to create new channel structures and relationships.

Will Compaq ever be a software company? No. In many cases vertical software will continue as today, some systems integrators and VARs will probably be moving to developing and selling only software. Operating systems will, increasingly, be controlled by operating systems companies like Novell, Microsoft, and the various Unix bodies.

But doesn't that leave an innovation and differentiation gap between some systems companies and Compaq? Not at all. The core of this new industry model is standardization. Our R&D expenses run around 5% of revenue. But, when you combine that with those of Microsoft, Intel, SCO, Novell and a dozen other smaller guys all developing for this open industry standard, it adds up to some pretty big numbers. And, we don't subscribe to the theory there's an absolute end to differentiation. Take a look at the automobile industry. Cars aren't commodities. Tell an engineer at Ford or GM that differentiation's impossible and I think you'll find some disagreement. The same goes for PCs. It's impossible to identify exactly what the differentiating factors will be right now, but all kinds of opportunities for differentiation exist.

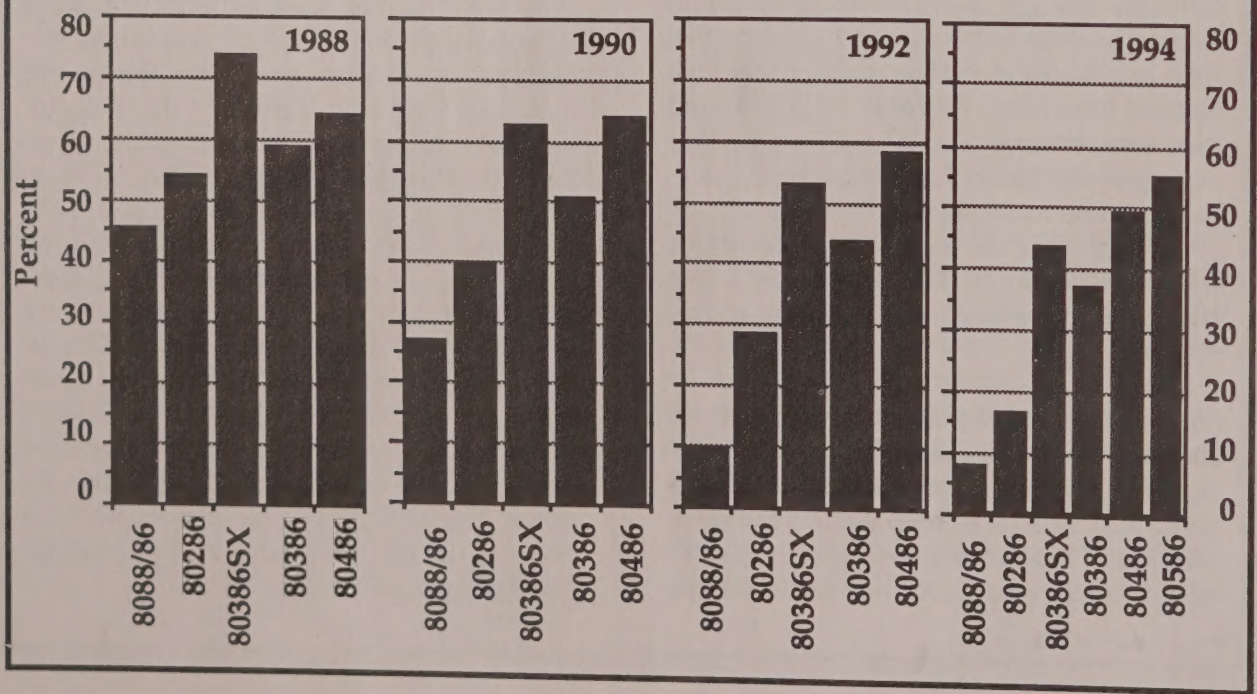
Personal Computer Unit Shipments by Intel Processor Type, 1988 - 1994

(Source: International Data Corporation, 1990)



United States Share of Worldwide Intel-based PC Unit Shipments, 1988 - 1994

(Source: International Data Corporation, 1990)



nies — the feeling that such success is, essentially, untouchable by forces of maturation or growth — is being eroded by these nagging issues:

CHANNELS MORASS:

- **Unnavigable channels clog dealers.** The PC distribution channel is, perhaps, the segment of the industry model under the greatest pressure to change. It is feeling a mighty squeeze, between declining margins and a fundamental shift in its core business from moving boxes to providing systems solutions.

  The PC distribution channel is slowly taking on a greater and greater proportion of the integration capabilities typically associated with systems vendors (see "The World According to Compaq," p. 4). Accruing the requisite skillsets, however, is a very slow process.

  In addition, selling more complex PCs is disproportionately more costly than just moving boxes. Particularly since raw price/performance keeps dropping. While the average prices of '386 and '486 boxes keep climbing, heavy price competition keeps margins lean. To make the easy sales, some dealers slash support and compete on the easiest differentiator around — price. As a result, price competition is wicked and margins fall.

  To make matters worse, microscopic product life cycles further cut channel profitability by intensifying inventory management headaches. There are not the 80286 shortage problems associated with the transition from 8088 systems in 1984, but effectively managing a supply of 80386s, '386SXs, '386DXs and '486s is no picnic.

LIFE CYCLE AND OBSOLESCENCE:

- **The product cycle driving the PC industry today is based on operating systems (OS).** For PC companies, that means that even when DOS is packaged with Windows 3.0, it is finished as the platform of choice among applications developers. And until OS/2 or some other operating environment with higher ceilings replaces DOS as the OS of choice, innovation will remain stifled. For PC users, the so-called OS "wars" perpetuate uncertainty and stall purchase plans.

- **Competing exclusively on technology has become impossible.** Personal computers that outpace the competition for more than 60-90 days are rare. Marketing and distribution are increasingly driving successful sales strategies, not just technology.

- **The easy sales have been made.** Let's face it, PC spreadsheet, word processing, database, and desktop publishing applications were catalysts for the creation of vertical segments that each had unique characteristics: price, performance and constraints. They were boom markets ready to happen. Each application just needed the appropriate level of hardware functionality and price. But now the rich veins have been mined out.

- **There is no "killer application."** What's more, it's becoming increasingly clear there is no single application to drive PC sales the way spreadsheet, word processing, database, and desktop publishing applications did through the '80s. None — sorry. Neither image (*GS* 25:19, April 6, 1990), nor multimedia (*GS* 25:19, May 11, 1990).

  So what? Since there is no killer application to pull the industry out of this jam and into the high-margin easy chair, margins will keep decreasing as competition for the remaining sales heats up.

- **The bus battles bred doubt.** This was the year that words gave way to deeds in the war of the bus architectures. But microscopic life cycles promote the perception, rather fear of, obsolescence. Compaq, HP and other members of the EISA consortium launched products based on the ri-

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WORLDWIDE PERSONAL COMPUTER MARKET 1988 - 1994, ALL MANUFACTURERS

(Source: International Data Corporation, 1990)

	Thousands of Units Shipped	Thousands of Units in Use	$ Million Value Shipped	Annual Growth in Value (%)
		United States		
1988	9,026	43,001	21,937	N/A
1989	**9,415**	**50,741**	**24,117**	**9.9**
1990	9,830	55,738	26,600	10.2
1991	10,448	61,819	29,550	11.0
1992	11,285	67,263	32,500	9.9
1993	12,182	73,049	35,450	9.1
1994	13,141	79,326	38,500	8.6
		International		
1988	10,768	38,008	29,255	N/A
1989	12,155	45,930	36,814	25.8
1990	13,883	55,727	43,368	17.8
1991	15,795	62,567	51,354	18.4
1992	18,036	73,085	58,766	14.4
1993	20,571	85,401	66,238	12.7
1994	23,400	101,317	72,393	9.2
		Worldwide		
1988	19,794	81,009	51,192	N/A
1989	**21,570**	**96,671**	**60,931**	**19.0**
1990	23,713	111,465	69,968	14.8
1991	26,243	124,386	80,904	15.6
1992	29,321	140,348	91,266	12.8
1993	32,753	158,450	101,688	11.4
1994	36,541	180,643	110,893	9.1

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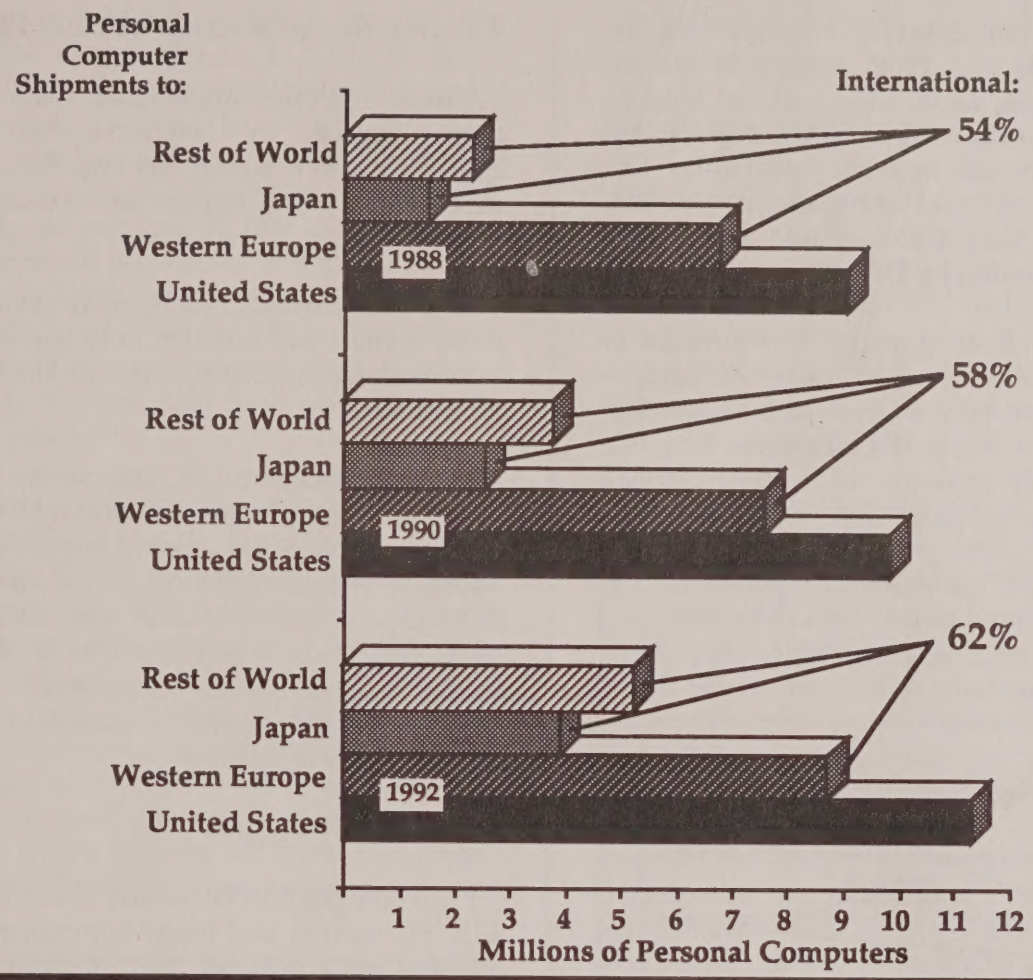
International Personal Computer Growth Exceeds U.S. Growth

(Source: International Data Corporation, 1990)



val IBM microchannel (MCA). IBM finally showed off some MCA capabilities. Among compatible makers, though, EISA seems to be winning the battle. The net result? More user uncertainty over standards and migration paths.

INTEGRATION:

- **Integrating PCs into MIS remains a problem.** Users concerned about migrating a base of MS-DOS-compatible systems into a distributed computing environment don't know which way to go. They are completely unclear about upward mobility and migration paths. Until users recognize the viability of different solutions, the uncertainty will continue.

VENDOR INFLEXIBILITY:

- **"Time to market" is no longer a cliche.** If Sun can introduce four new systems in 12 months, companies calling themselves PC vendors better be able to, too. The new reality is that companies that cannot produce a new box every four to five months will lag behind and lose market.

None of these impediments are great enough to compel a phase change in the overall structure of 1990s PC markets. Combined, however, they signal an end to the PC business as usual.

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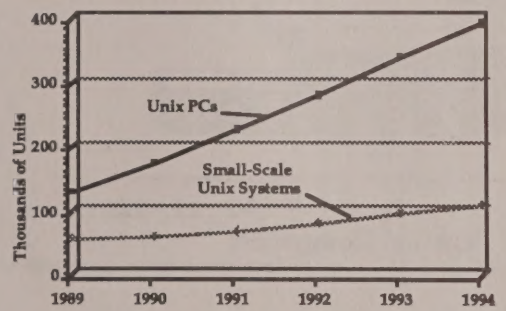
PCs in Mini Land

The PC Unix market grew over 30% between 1988 and 1989, largely at the expense of the small scale systems market. Similar growth rates in 1990 are likely, unless small-scale systems companies can dominate the emerging server market. Otherwise they will continue to see their business eroded by PC systems.

Although Unix is not currently crucial to the revenues of any of the large PC companies, it represents a great opportunity for them, particularly if OS/2 fails. The PC-based Unix systems offer better price/performance, a large software base developed for Intel machines and a low-cost indirect channel strategy.

Unix PC Unit Sales Top Small-Scale
Unix PC and Small-Scale Unix System Unit Shipments, 1989 to 1994
(Source: International Data Corporation, 1990)



In response, the mini companies can offer more experience in servicing and supporting complex systems, a software base developed by VARs (though for different architectures so not offering the critical mass of Intel software) and in some cases, experienced direct sales forces. They will be fighting the PC companies for the server market, a battle which will be joined by specialized server companies such as Auspex and technical workstation companies like Sun and Solbourne.

The Accidental Success of Unix PCs

Almost half the single user Unix machines shipped in 1989 were PCs. The growth rate in this segment was 32%, one percentage point higher than technical workstations.

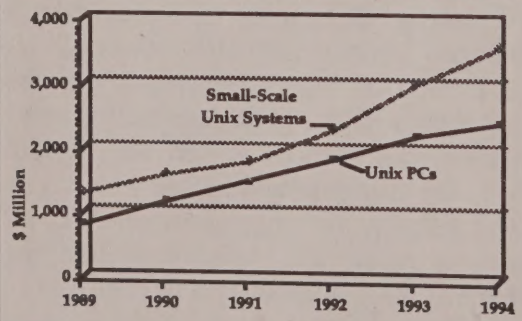
So if such inroads can be made by accident, is there any limit to how successful PC companies be if they focus on the Unix PC market?

What advantage do PC companies have over their large rivals? For the small scale systems market the answer seems clear, equal or better performance on cheaper hardware. Low research and development (R&D) costs and small or no direct sales costs help profits and give PC companies the kind of cash resources needed to wage wars of attrition.

Differing Strategies

Price competition is already fierce in the U.S. PC market and many companies are making price cuts on their medium and low end boxes. In an attempt to improve margins, they can target the high-end multi-user PC market, as Compaq (Systempro) and Dell (433TE and 425TE Tower systems) have done.

But Lag in Revenue
Unix PC and Small-Scale Unix System Revenue, 1989 to 1994
(Source: International Data Corporation, 1990)



The balancing act here is that while it's all about price for low end PCs, at the higher end, service and support comes to the fore. Companies argue that large users in Fortune 500-type sites have few support problems that can't be solved internally. Even if this is the case, it will not help in the thousands of small businesses which are logical markets for this kind of system. Those small businesses which are used to Altos or NCR Tower systems will be used to some level of support from their suppliers and those businesses which are automating for the first time will inevitably have problems.

One strategy, which Compaq follows, is to hand support to dealers and provide training for those not used to selling complex systems, but bringing them all up to speed will take some time. Other companies like Dell, provide service and support by phone and fax from its headquarters or regional sales offices. We believe this strategy will work better in large organizations than in small business, where Dell is already losing share to third tier PC companies and Far East clonemakers.

Applications availablity is a key to success in this market but despite the recent hooplah over the Intel/AT&T/SCO announcement, we don't expect a shrink wrapped Unix software market anytime soon. This could hurt the PC companies in their battle for the Unix desktop, but will not prove as much of a handicap in the small scale systems market where users are used to developing solutions inhouse or buying them from VARs.

Dell's approach, as might be expected, is more direct. Instead of letting VARs worry about software, it launched its Dell Station Unix/DOS workstations which come pre-loaded with Dell's version of System V and the Uniplex office automation suite as well as support for X Windows with Motif.

Although it's too early to say how successful it has been, Dell's Unix business is fairly small (around 15% of its 386 machines run Unix) and any increase is significant.

Challenges Remaining

Price/performance advantages can be short-lived. The PC companies are at the moment competing in a commodity-based world and can keep their R&D costs low which helps their margins, but as more and more technologies (including multiprocessing) become standardized what is the value-add that PCs can offer.

The huge Intel software base is a definate plus for PC companies. However, this advantage disappears with technologies such as multiprocesing where no significant software yet exsists.

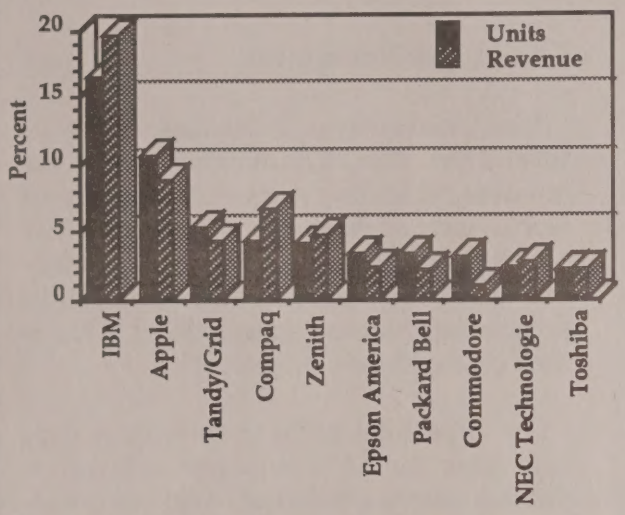
It is also far from clear that PC companies can offer the kind of support necessary to integrate PC based systems into larger networks and maintain them. Here the mini companies have a historical advantage, having worked with systems integrators and built up VAR channels. The PC companies will be trying to steal these VARs however and if they can offer good enough margins they may succeed.

Conclusion

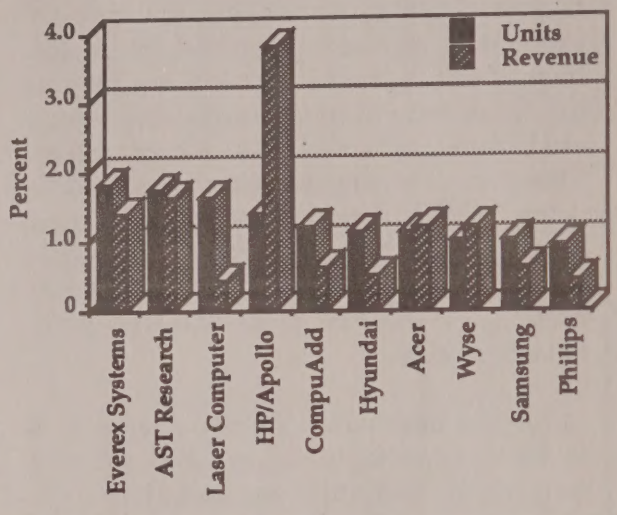
The keys to success in this market are competetively-priced hardware, distrubution channels, applications software and service and support. PC companies are well positioned because they are stronger than mini companies in the first two (arguably three) categories. Those PC companies which will succeed in this marketplace will be those who can better assume the risk of integration and shield users from service and support concerns.

— With Kate Oakley, Senior Analyst, Unix

1989 United States Personal Computer Units and Revenue Market Share of Top Ten Vendors
(Source: International Data Corporation, 1990)



1989 United States Personal Computer Units and Revenue Market Share of Second Ten Vendors
(Source: International Data Corporation, 1990)



PC Companies Seek Niches — Last Vestiges of the Old PC Market

Nippon Steel Goes Mobile

How can companies pretend the PC industry rules aren't changing? By finding niches where traditional patterns of PC competition still dominate. That way they can avoid the unpleasantries of 1990s PC markets and still lay a claim, or try to anyway, to those exciting high tech markets of the future. Yeah, right.

With overall sales flat, niche markets like mobile PCs provide growth opportunities where PC companies can still act like PC companies. They can rake in a few more easy sales before the raking gets really tough, like it now is in the rest of the business.

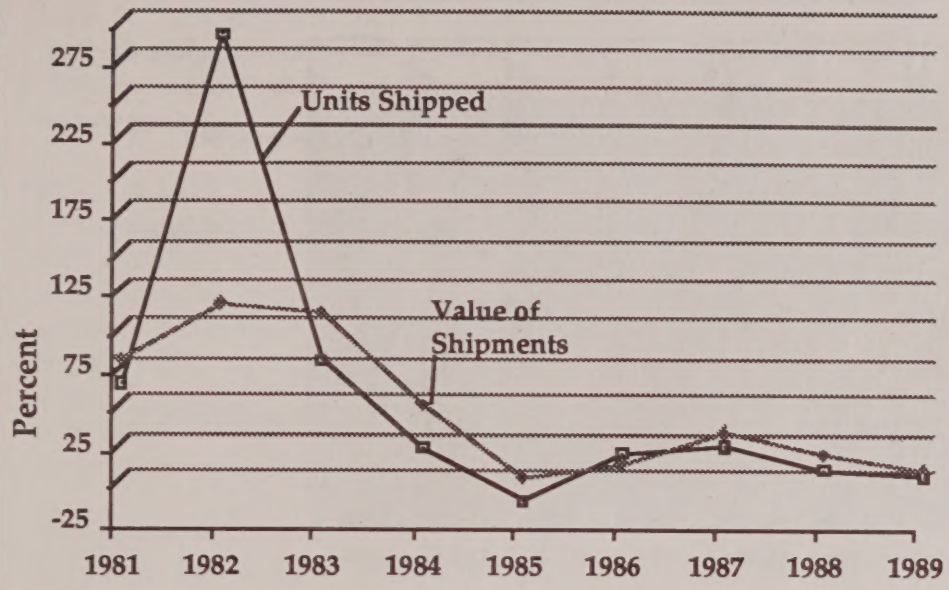
What are they? Laptops and notebooks, for sure. Maybe the elusive "personal workstsation. Even servers, with some variations.

How fast are they growing? Get this: fast enough for Nippon Steel to introduce a laptop PC in August.

In 26 years the ***Gray Sheet*** has watched insurance companies try to sell mainframes and oil companies try to sell office automation. We've seen companies seize on core strengths and expand into new markets. But we've never heard of a smokestack, heavy-industry manufacturer suddenly claim PC expertise ("we've been working on this for years ...") and launch itself into such a crowded market.

That kind of bold move can mean only two things: either Nippon Steel has really missed the boat (highly unlikely), or the combination of very low profile hard disks, flat panels and cheap memory and microprocessors are creating new growth that's less a market subsegment than it is a whole new application of technology. The ***Gray Sheet*** will be reexamining (see *GS* 24:9, November 1988) mobile computers soon.

PC Market Growth Tumbles ...



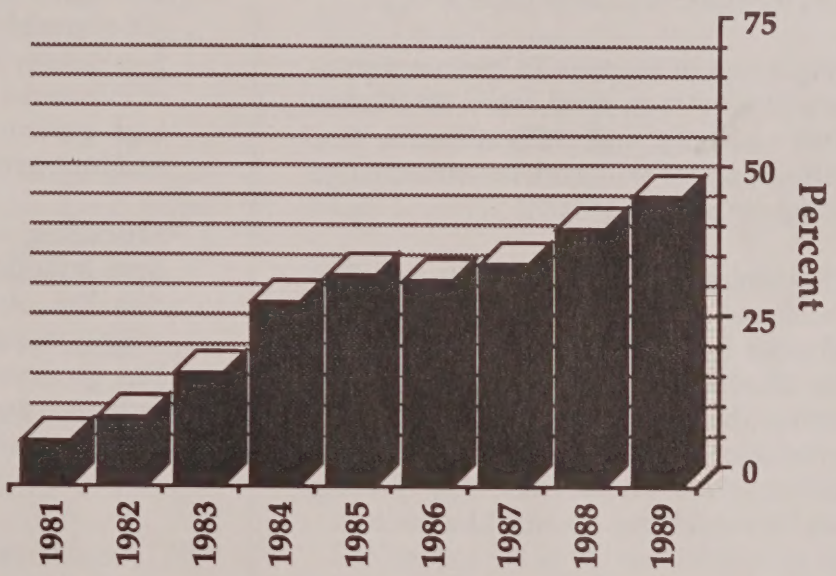
The Decline in Growth Rates of Worldwide PC Unit Shipments and Shipment Value, 1981 - 1989

(Source: International Data Corporation, 1990)

... But PCs Keep Gaining

Personal Computer Proportion of Worldwide Hardware Spending Keeps Rising

(Source: International Data Corporation, 1990)



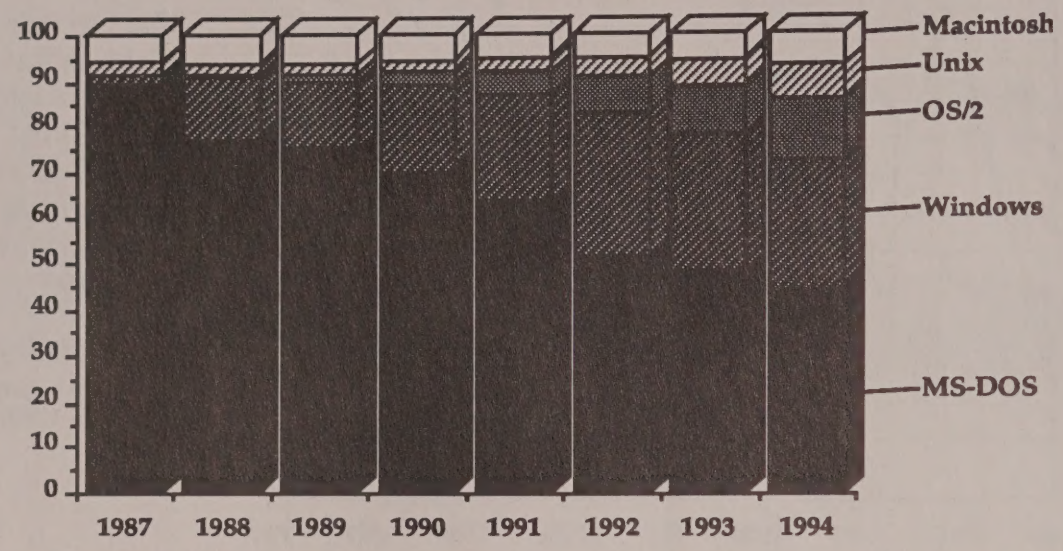
PC Industry Barriers to Growth

(Source: International Data Corporation, 1990)

Growth Options	**New applications**	**Traditional applications**
Growth Potential	**Remaining 50% of white-collar workers without PCs**	**Replacements and upgrades**
Limiting Factors	**Practical multimedia, image applications still several years away**	**Standards, channel growing pains, migration concerns, potential saturation**

Worldwide Operating System Market Share (Percent), 1987 - 1994

(Source: International Data Corporation, 1990)



What's Next? PC Fallacies

Competition in the new PC industry paradigm will revolve around a new set of competitive strengths and differentiators. Successful strategies will reckon with change, that may not appear as such:

- **The personal workstation illusion.** Personal workstations — high-end PCs loaded with fancy graphics — have created the illusion of a personal workstation market that is more product overlap than a real market. Just ask Next. It had a devil of a time in the retail channel, so Sun figured it would, too. Sounds like trouble.

- **The figment of easy server sales.** Emergence of microprocessor-based, minicomputer-like superservers is clouding traditional computing boundaries. But for anyone in this market for the longhaul, they don't eliminate the need for traditional computing support services. Server sales may look easy and may resemble PC markets of the past, but in the long term they involve building a new structure for delivering services through the distribution channel.

- **The niche illusion.** The biggest opportunities worldwide are niche opportunities, particularly in the United States. Vendors of PCs in the U.S. are quickly moving into high-growth segments like notebook PCs and high-end network systems.

- **Muddling with bundled modems.** Modem bundling increases ASPs and functionality. And a modem in every PC might provide the push to legitimize online services. In terms of recreating lost potential and revivifying stagnant markets, however, bundled modems don't do a heck of a lot.

PC Realities

Can PC companies accustomed to growth rates in the 20-30% range survive in the lower, but still healthy, new ranges? The answer depends on how they realign around the new realities of PC markets. Moving into the 1990s, successful PC strategies must accommodate these key strategic juggernauts:

- **Distribution necessitates integration.** Some dealers must take the often painful steps toward becoming integrators, not just hardware pushers.

- **Dealer integrration strategies demand more comprehensive vendor support.** In turn, PC vendors must develop workable programs for assisting their dealers in making the shift from hardware pusher to integrator.

- **Price a less important differentiator.** Hardware prices will always be important. But the packages in which hardware is enshrouded — software, handholding, support and troubleshooting — becomes increasingly important in the reconstitutesd PC market. Second-tier PC vendors will have an increasingly difficult time differentiating exclusively on price.

- **The global PC market.** The U.S. PC market is one key regional piece of a worldwide pie. It is comprised of pockets of niche opportunities — a throwback to the PC market of old — rather than broad growth potential. Picking the low-hanging U.S.-market fruit is a strategy of the past.

- **Faster is no longer just better.** Now it's absolutely critical. Vendors must build faster products faster, and get them to customers and partners more quickly.

Regardless of size and market share, personal computer companies are subject to many of the same prevailing conditions: customer demands, channel tension and competitive environment. The winds of change are equally blustery for every company.

And they have only a handful of strategic alternatives with which to chart a course through the changing PC market. For smaller organizations this may appear to be easier. But many smaller PC companies lack the necessary resources. Effecting a change in how they compete in the PC industry will, likely, tap all their resources.

Many of the most critical changes will occur in PC vendors' dealer strategies and relations. There's already much action. Large and small vendors are revaluating, and changing, distribution strategies. On the low end, Zenith and IBM are looking at the mass merchant channel. On then high end, AST and ALR are looking for VARs to deliver PCs to vertical markets.

The Old, the New and the Newer

Downsizing is technological substitution, not business as usual. It means running more complex applications on commodity-like hardware. More complex applications demand more complex business systems.

In short, downsizing means the PC market as we have known it is dead. PCs themselves will continue to thrive. But the structure that developed them, that marketed, sold, delivered and supported them is no longer functional. As such it will slowly perish.

And, as such, only PC vendors that are able to reconcile the changing order will continue to thrive. Any one company can do it, but not all will. Look at the minicomputer business. Despite growing consensus that the business was changing in fundamental ways, some companies didn't change with it.

Those staggered along on expensive infrastructures which, in a weird way, were used to justify peddling proprietary systems at exorbitant rates. Leaner and meaner vendors — with products that capitalized on the fundamental changes — hit-and-ran the market, outclassing the supposed class of the field.

The demise of the PC industry as we know it begets a "newer" systems company. It is characterized by an ability to build business on industry standard blocks and sell their products through low-cost indirect channels. Most importantly, it expects channels partners to manage a critical portion of the supplier-customer bridge: the part closest to the customer. The successful PC vendor will drive the ability to serve users to distribution partners — the tip of the distribution channel. Then, simultaneously, it will ride the crest of the wave.

—With Peter Burris, Director, IBM Advisory

ASK Computer has teamed up with EDS and HP to buy Ingres. Ingres had been looking for a buyer; ASK uses HP minis and workstations, and has also been using Ingres software since February. After the requisite organizational struggles, the combination presents some intriguing strengths, primarily manufacturing, and at least one sure customer — the biggest automobile manufacturer in the United States. EDS and HP will end up with 20% and 10% of the combined company.

Fujitsu stole IBM's thunder the day before Summit, or tried to, billing its new M-1800 group as the highest-performance general-purpose computers around. No thorough benchmarking has been completed, but there's no doubt the most impressive technology no longer comes from these shores, led by HDS's plug-compatibles and these Fujitsus.

Amdahl's response to ES/9000 is a major price cut on machines shipping today and a promise of machines that won't ship until far into the future. Beset on the one hand by a rejuvenated HDS and on the other by IBM pressing its control of the high-end architecture, Amdahl is searching for answers in a game with rapidly escalating stakes and has come up with the 5995 series: six currently shipping models and four next-generation models.

Stardent is regaining credibility as a viable and financially stable vendor of graphics workstations after a summer of internal power struggles and management squabbles. Eleven months after the painful merger of Stellar and Ardent, Stardent has introduced its first product — Stiletto, the low-end desktop system and a new high-end VX graphics subsystem for the 3000 series.

Dell Computer signed an exclusive retail distribution agreement with Soft Warehouse. Dell, which will provide toll-free technical support and next-day service from Xerox and will train Soft Warehouse sales personnel, is confirming that it cannot rely solely on direct and mail order to reach potential users. In addition to driving up cost of sales, Dell's first foray beyond the incoming 800 number indicates an aggressiveness on the marketing side which previously had only been apparent back in the development labs.

NeXT's next, a 68040-based product line, resolves many of the company's former weaknesses — performance, price, floppy drive and color. However, its application suite is still not mainstream enough to attract more than academics. Unless NeXT ships on the order of 50,000 units in 1991 it will face serious financial difficulties.

Oracle will post a first quarter loss. That's what happens when you fall halfway short of 50% sales growth projections. As a result, Michael Fields, formerly VP of field sales and consulting is now president of Oracle USA, replacing Gary Kennedy who retains his position as head of Oracle Complex Systems.

Server notes: Banyan announced Vines support for the Compaq Systempro's symmetric multiprocessing capabilities, while Oracle announced Oracle for Systempros running Netware. Compaq's archrival NetFrame announced its servers will be resold by Olivetti in Europe, Canada and Australia, hoping the deal might be worth $200 million over the next three years.

Digital has proposed another voluntary termination package, this time to 6,000 employees, some of whom, clearly, should have jumped for the more alluring package offered last year.

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REPORT

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From Crawl to Sprint: Mobile PCs Approach Takeoff

Laptops, Notebooks, Portables and Palmtops — the Fastest Growth Markets of the 1990s — Are Poised to Overcome Barriers

One personal computer market that will continue to experience double-digit growth rates is the mobile PC segment. Not a week goes by but that a new mobile PC — traditional portable, laptop, notebook, palmtop or hand-held data computer (HHDC) — isn't announced.

While worldwide, overall PC sales growth will languish in the 12-15% range over the next five years, mobile computer sales are expected to grow at more than 20% per year, according to IDC's PC Hardware program. And some subsegments are expected to grow even faster.

But the nature of competition defining the mobile PC market is, in many ways, quite dissimilar to traditional PC markets. Consider these facts:

- **Mobile PCs are more than just more miniaturization.** They represent a quantum leap in PC technology. The emergence of cellular modems, high capacity (60+ MB) 2.5" disk drives, and high-resolution flat-panel displays combine to create a machine with more functionality than today's desktop PCs.

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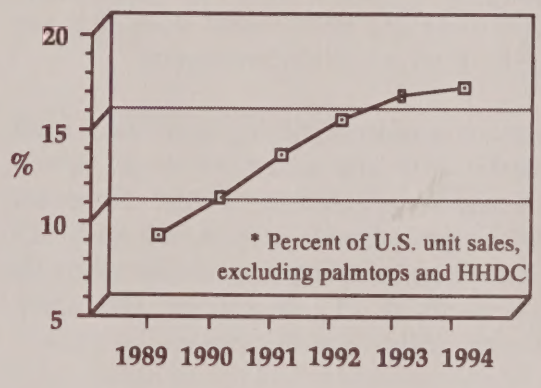
Mobile PCs Grab Share of Total 1989 Personal Computer Market*
(Source: International Data Corporation, 1990)



- **Mobile PC markets are still highly segmented and immature.** Palmtops are halfway between notebooks and HHDCs, but can't do either function well enough to drain a significant amount of sales from the other two segments. The three segments still exhibit unique competitive characteristics, and still require very distinct strategies.

- **Mobile PC price-performance leaps are faster and higher.** New products are price-performance leaders for no more than 30 to 45 days.

- **Palmtop prices are too low to support the dealer channel.** Most mobile PCs sold to individuals — certainly all on the low end — will be sold through mass marketers or through catalogs and tele-

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marketing. Sales of fleets of laptops for dedicated applications will continue to flow through direct sales forces and value-added dealers.

- **For once, Japan is a leader in *consuming* a new technology.** Japanese PC users are gobbling up mobile PCs far faster than users in any other region, largely due to space limitation.

Is mobile PC market growth anything more than a signal that PC users like getting out of the office every so often? Or, is it simply a logical stepping stone toward the ultimate in personal computers? And, if the PC industry, as we know it, is dying (*GS* 26; 2-3, September 21, 1990), what does that say about long-term mobile prospects?

The truth lies somewhere in the middle. Mobile PC markets still have a long way to go. So does any revolutionary technology. And the mobile market is the computer industry's hottest. It's also one of the few remaining markets where the old standards of PC competition still apply. Technology still sells mobile PCs.

Until producers can deliver newer technologies – reducing power consumption and weight, increasing functionality and speed – in enough volume to lower prices, the mobile PC market will be strong, but not phenomenal. For the 12-18 month time frame, mobile computer sales are a function of technology, and each discrete segment of the mobile market will remain distinct.

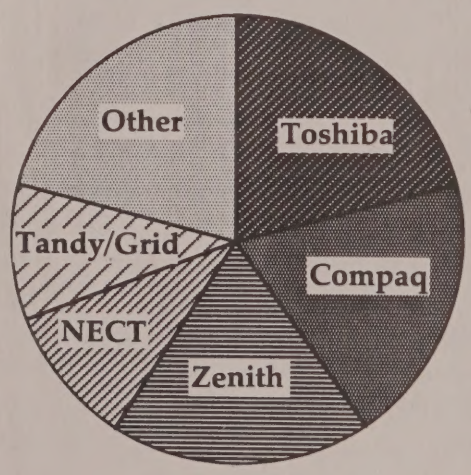
Right now, companies with a PC line lacking a mobile component are at a disadvantage. In the long term, they are in trouble. When mobile PCs come of age and threaten the desktop, the same gradual shift that's gripping the PC industry will likewise affect mobile markets.

Market Data

The U.S. portable computer market was expected to explode in 1989. But it only issued a loud bang. Unit growth from 1988 in the IBM-compatible market was a moderate 10%. Most upper-tier vendors experienced a good year, but fewer lower-tier suppliers made significant gains. The highlights:

- The total U.S. portable market will grow 20% (compounded annually) in units and 18% in dollar value between 1990 and 1994.
- The active installed base will grow from 4.5 million units in 1990 to 9.8 million in 1994.
- Unit shipments of notebook PCs will grow from 310,000 in 1990 to 1.3 million in 1994.
- Toshiba, Compaq and Zenith accounted for almost 60% of total U.S. portable dollar volume.

Portable/Transportable, Laptop, Notebook Vendors, United States, 1989
(Source: International Data Corporation, 1990)



Total 1989: $2.4 billion

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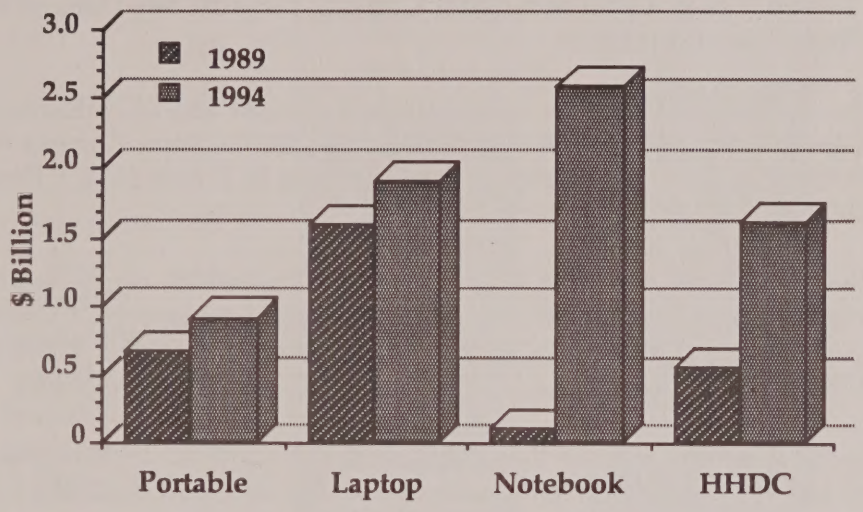
United States Mobile Computer Growth by Market Segment, 1989 and 1994



	CAGR 1989-1994
Portable	6.3%
Laptop	3.6%
Notebook	87.5%
HHDC	24.5%
Total	19.2%

(Source: International Data Corporation, Glass Consulting Group, 1990)

Technology Trends Driving the Mobile PC Market

Price performance. Most development activity in the 1989 portable market centered on the 80C286 processor. At yearend, 80386SX-based AC, battery and notebook products were announced and delivered. By Q3 1990, major vendors had introduced 16MHz 80386SX-based products, and many were in the process of adding 20MHz SX products to their lines.

The SX will continue to dominate the first half of 1990. Gradually vendors will release 80386DX-based laptops. Motorola 68020-, 030-, and 040-based products are also expected in the '90-'92 time frame.Toshiba introduced a SPARC-clone laptop in June. Sub-two inch 20-, 40-, and 60 MB winchesters are coming in 18-36 months. High performance chip sets squeeze space even further. Need we say more?

Decreasing power requirements. Mobile PCs are gradually reducing their power needs in two basic ways: with more efficient chips, and with less power-hungry displays and disks. Intel's new 386SL, taking a cue from disk drives, shuts itself down when it recognizes it is not actually being used.

Memory options. Flash memory, data compression and RAM cards are yet to have any great impact on laptop markets. Recent work by the PC Memory Card International Association (PCMIA) may change that. It pioneered the flash memory card standard that will soon allow 2MB cards — of completely nonvolatile memory — made by Intel and others to function in different types of hardware.

Intel expects to introduce 16- to 20MB flash cards by late next year, and cards holding perhaps as much as 64MB in 1992. Although the reliability of flash memory is yet unproven, that much data on a credit card goes a long way toward eliminating the need for hard disks, diskette drive adapters, and other bulky storage and interface devices on mobile PCs. It drives battery requirements down, too. And palmtops, the most portable of the portables, might become more so.

The Five Mobile Computer Markets

Portables/Transportables include AC-powered clamshell portables, as well as briefcase- and lunchbox-shaped systems weighing from 13 to 22 pounds, have gas-plasma or LCD displays, are based on 80286, 80386SX, 80386, 80486 microprocessors, and are IBM compatible. Current examples are the Toshiba T3100e, T3200, T5100 and T5200; Compaq Portable 386; Dolch PAC line; IBM P70; and NECT PowerMate Portable SX.

Battery Laptops weigh between 7 and 17 pounds, have clamshell designs and LCD displays, and are based on Intel 80C86, 80CZ86, 80386SX, 80386, or Motorola 680X0 chips. Current examples are the Toshiba T1200 line, Zenith SuperSport line, Compaq SLT line, NECT Prospeed line, Apple Macintosh Portable, and Atari Stacy.

Notebooks are battery-powered laptops weighing seven pounds or less which can be stored in a briefcase. In general, these products have many of the features of larger laptops. Current examples include the Compaq LTEs, Zenith MiniSport, NECT Ultralite, Toshiba T1000SE and XE, Panasonic CF-150, Poqet, Sharp 6220, Tandy 1100FD and 102, and Cambridge Z88.

Palmtops are handheld personal organizer tools that usually feature a limited LCD display, a limited I/O, and reduced-size keyboards. Current examples include the Atari Portfolio, Casio BOSS, and Sharp Wizard.

Handheld Data Computers (HHDCs) are data collection devices that posess enough memory and processing power to manage the accumulation and communication of data to a remote host. Typically, they communicate with a host processor via a direct-connect jack, modem, or infrared or radio frequency (RF) link. Current examples include products manufactured by Intermec, Symbol Technologies and Telxon.

Interface improvements. Development of new interface systems — everything from trackballs and touch screens to pens and handwriting recognition systems — are the mystery element in the growth of the mobile market.

For example, bar coding catapulted the functionality of the first mobile market, handheld computers, from glorified calculator to inventory manager, and much more. Likewise, newer I/O technologies have the potential to spawn whole new applications, and then markets.

Already, Grid Systems' Gridpad has taken the keyboard out of the laptop. Its character recognition abilities allow users to write and select commands with a pen-like device. The Gridpad is used in traditional HHDC markets where bar coding is less efficient than jotting with a pen.

Barriers Inhibiting Mobile PC Market Growth

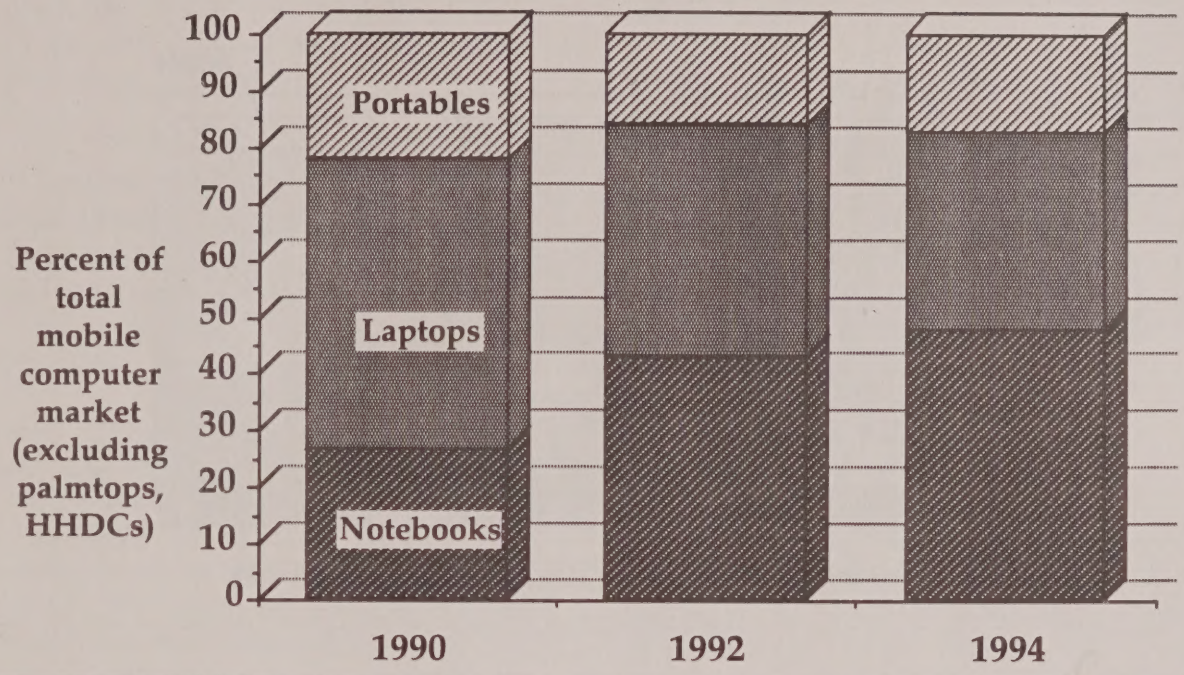
Displays. The price and weight of high-resolution, color flat-panel displays is holding back mobile market growth. And it won't be getting better until a new generation of the newest technology — color active-matrix liquid crystal displays — matures, in the '93-'94 time frame, even though flat-panel displays are being developed for mobile and desktop PCs alike.

Most mobile PCs now use the monochrome video graphics array. It will continue to be the competitive benchmark for the next year. Nonactive matrix, much less expensive than active matrix, is available in products from Sharp and NECT.

Color active-matrix LCD displays currently cost from $3,500 to $4,000. Some reports

U.S. Portable/Transportable, Laptop, Notebook Unit Sales: 1990, 1992, 1994

(Source: International Data Corporation, 1990)



indicate that by 1995 the wholesale quantity price will drop to $300-500.

Software. Expecting DOS to control tomorrow's laptops is like expecting a steering wheel to drive the space shuttle. Windows is a step in the right direction, but two kinds of software deficiencies are apparent: basic operating systems and subsystems to support advanced I/O components, and applications. Of the two, the first is clearly most critical, since many applictions can be drained off desktop PCs.

Interface options. Sound familiar? It should. Until pen interfaces, bar coders, and handwriting or voice recogntion systems really *work* on laptops, difficulty using them will inhibit users.

Much attention is paid to companies developing handwriting recognition algorithms. Some developers claim 85%, 95% even 97% recognition of printed characters. But that's not good enough. Until character recognition systems are 99.99% effective, and keyboard-averse executives are told to make the choice of "conform or else," the systems will not have any great effect on mobile PC sales.

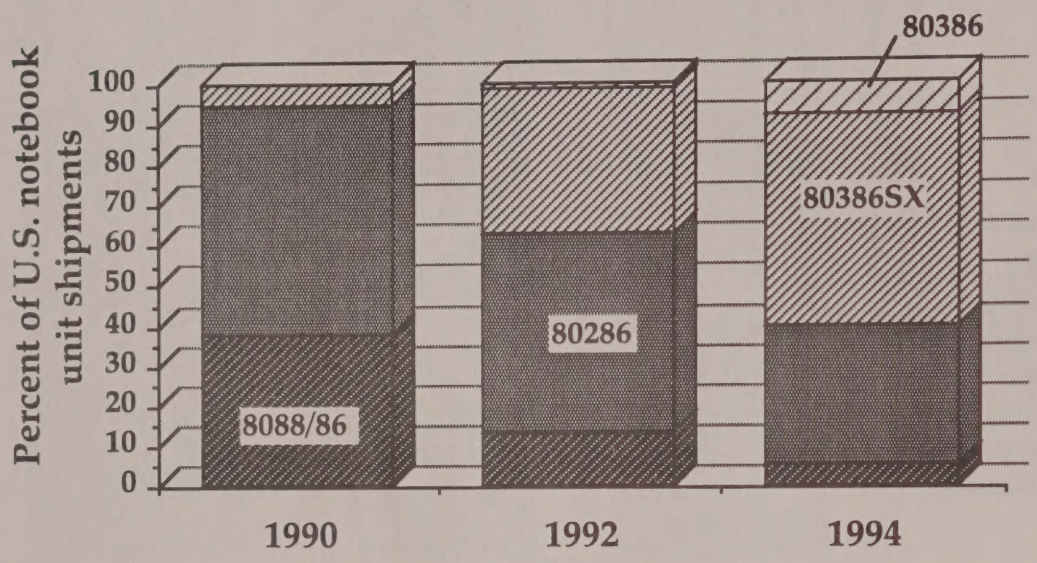
The handwriting recognition component of some mobile computers is a first step in creating more functional mobile computers. Go Corporation (with IBM's help), leads the way.

Battery power. Batteries are still the heaviest part of a mobile PC. While Intel claims the 386SL will reduce microprocessor power consumption by up to 50%, similar advances are still necessary for the two power hogs of mobile PCs: disk drives and displays.

Storage. In mobile PC markets, little is more obvious than "smaller is better." The hard drives in today's laptops, 2.5" 20MB disks, cost end users about $450. But the newer laptop hard disks, 2.5" 60MB+ drives, will be more attractive ($/MB) at about $750 to users.

U.S. Notebook Shipments by Processor Type: 1990, '92, '94

(Source: International Data Corporation, 1990)



IDC Completes Portable Computer Research

IDC's PC Hardware program has recently completed an exhaustive study of the U.S. portable computer market dynamics: *The U.S. Portable Computer Market Review and Forecast, 1989-1994*. The study focuses on vendors in the IBM-compatible portable/transportable market, but also includes battery laptops and notebook PCs. It examines vendors' performance in U.S. markets in 1989 and forecasts the market through 1994. For more information, please contact Bruce Stephen, director of the PC Hardware program, at (800) 343-4935, extension 4269.

Mobile Modems, Not LANs

The hottest connectivity market for desktop PCs is local area networking. But for portable PC connectivity, LANs take a back seat to modems. Vendors polled by the IDC PC Hardware program indicated that as many as 70% of their portables are sold with modems. For good reasons: modems allow mobile PC users to load files off their office system, and LAN interface cards are still rather bulky and expensive. And even when price and size come down, modems will remain the medium of choice: they simply offer too much functionality and versatility than on-the-go LAN connections. For now, however, despite their popularity, modems remain an option and not a feature in most mobile computers.

Laptop, Notebook Notes: New Products, Expansion, and Communication

Some recent laptop news: an announcement by the current market leader — **Compaq's** new LTE 386/20 — and **IBM's** laptop nonannouncement. While somewhat exorbitantly priced, the LTE is pretty much state of the art, while certainly not setting any great performance records. It *is*, however, Compaq's third generation laptop. **Apple** and IBM have yet to enter the market. Indeed, IBM was rumored to have again delayed — and possibly canceled — the scheduled October release of a laptop. Perhaps memories of the ridicule that greeted the PPC still linger. IBM still claims to be field testing a handwriting recognition mobile computer, perhaps developed in part from its relationship with Go Corp. **Other notes**: **Grid** expanded its direct sales and support office in Europe to ten by joint agreement with two other Tandy subsidiaries and sister companies.

And that won't change until production volumes is increased. When manufacturers of the best 2.5" products — PrairieTek, Quantum and Conner — ramp up production, costs will decline. Within 24 months 2.5" will be really attractive.

The Confluence Illusion: Mobile Markets Remain Distinct

In one way, the growth of the market for mobile computers is counter to a major trend in PC markets: the process of market segmentation.

Usually PC markets become more granular with age. PCs, fitted with custom hardware and software, are used to address specific problems in specific markets and industries. The generality which surrounded the first PC products, the IBM PC and the Macintosh, has coalesced into very distinct price-performance bands: network file servers, power-user workstations, or network nodes.

Vendors of products in mobile markets seek lighter, easier-to-use, more rugged products with better displays, and more processing power from smaller batteries. Theoretically, with enough processing power and the right software, a mobile PC can perform any number of functions. Vendors might be able to deliver power and ease of use proportionate to the needs of several of the five market segments.

The tactics of some mobile computer companies are bearing this out. Take Tandy. Its Grid subsidiary gives it a broader line of mobile computers than any other company. It is a major player in several mobile markets. Instead of increasing granularity, mobile PCs seem to be tending toward confluence.

But expanding into those new markets is not as easy as just plugging a bar coder into a palmtop and making an HHDC. Market confluence is still illusion. It will be some time before Compaq builds a data collection device like Telxon's. Or a palmtop electronic rolodex.

Sure, Grid can cross over into new markets with the GridPad, but the rules are different. Different user needs, different channels, and different support structures. Building synergy on core strengths — miniaturization, display technology, battery enhancements — is sound strategy. Expecting technology to tear down market definition overnight is not.

When Desktop PCs Go Mobile

The most important market for mobile PC vendors is in their backyard: tomorrow's office PCs will closely resemble (in shape and size, anyway) today's portable PCs. Desktop PCs will gradually go mobile. Two evolutionary paths emerge:

- **Transportability will be essential** for even the most powerful *personal* computers.

- **Increasing miniaturization** will create a new ultra-mobile market. Motorola's dream of a portable communicator in every pocket might meld with pocket calendars, spreadsheets and word processors, too.

The fragmentation endemic in today's mobile computer markets will gradually crystallize around these trends. In the short term, the distinction between notebooks and laptops will grow faint. A two-tiered market will likely emerge in the long term, with PCs resembling notebooks, and a new class of cellular personal organizers/ communicators bringing up, literally, the low end.

— With Mark Levitt, Alexa McCloughan, and Bruce Stephen

Amdahl responded to IBM's ES/9000 announcement with the 5995, including the first eight-way machine in the S/370 (and 390) world. Six of the ten new machines (based on the 5990) are priced aggressively and are already shipping. The other four provide larger memory capacity, improve price-performance from 18% to 26%, and top out at 315MIPS. They ship Q4'91. Amdahl's Unix V.3.1 offering, UTS 2.1, was released in late September.

Apple's three new Macintoshes, coming in the wake of rampant frustration from Apple II buyers and potential customers for low-end Macs, are just enough just in time to forestall serious problems. Two concerns: the LC has a completely new bus, which throws expandability into question, and only the Classic is priced low enough for casual home users. But evolving the product line's the name of the game, and overall Apple did a good job at offering upgrade paths and options. It's just unfortunate it picked a smarmy name like "Classic." Someone at Apple, it seems, still bears scars from the "sugar water wars."

Top vaporware vendors Lotus and Ashton Tate were among a group of software companies that announced the formation of the "Software Business Practices Council" last week to mute hype and uphold honorable accounting principles. But the group gave no hard outlines of how it might tone down exaggerated claims, and Computer Associates, IBM, Microsoft and Oracle were all conspicuously absent. Coincidentally enough, Oracle's "Pinocchio-buster" ad ran opposite the announcement notice in the *Gray Sheet's* sister publication, *Computerworld.*

DEC's new Intel SCO Unix boxes are aimed at small businesses in general, a small businesses needing access to the growing base of SCO applications, specifically. DEC will have to be careful, however, that its MicroVAX VAR base is not too taken with the new products. Even manufactured in Taiwan, margins will be lower than those on VAXs.

DEC has more up its sleeve in the short term — the VAX 6000/500 and new PVAX, II and a 3100 (next week). In the beginning of November, DEC is expected to roll out new RISC/Ultrix minis, tower configurations of the latest VME bus 5000s.

IBM uncovered a diskless workstation, the rumored and long-awaited PS/2 Model 55LS (LAN Station), a diskless version of the Model 55 SX. But it's a bit pricey, even for IBM.

Oracle's Q1 loss was primarily due to mismanagement of U.S. operations, then a soft domestic market, and not by fundamental changes in the market.

Just as the Appeals Court reinstated DG's hundred million dollar Interior Department contract for Aviion workstations and servers — a move which bumped up DG's stock 18% — it was leaked that a House subcommittee was looking into DG's payment to a competitor to stop pursuing the contract. While such payments are common ways of speeding up government contract processes, should the contract be delayed, rebid, or worse, it would be a tough blow for DG.

Unisys is attempting to convince customers that its long-term plan to tie together its various product lines — along with those of the competition — in an SAA-like scheme of 4GLs, networking, and programming interfaces announced last month, is as viable as SAA or DEC's NAS.

F Donald Bellomy

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Is the Computer Industry Becoming More Susceptible to Changes in Economic Activity?

What's the relationship between changes in economic activity and computer hardware spending?

During any impending economic downturn, that question is asked of IDC's top analysts more often than any other. In the past, their typically unequivocal — and correct — answer has been, "practically none, most likely."

Historically, IDC's data show that changes in the level of economic growth plays an almost completely indiscernible, role in determining computer hardware spending. The industry has displayed cyclical trends based on product life cycles, new introductions, and replacement rates. Not GNP growth.

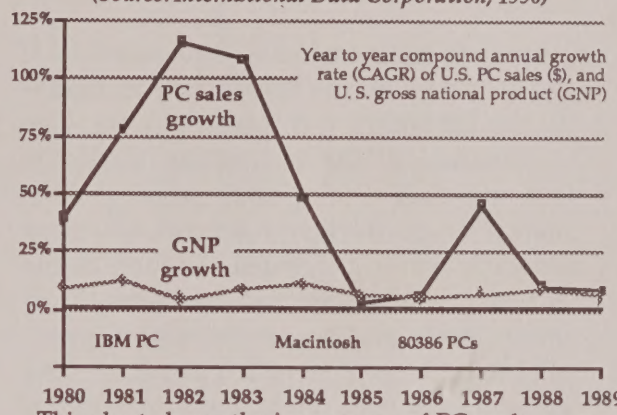
A change may be taking place. As the computer industry matures, it may be showing signs of a new susceptibility to changes in economic activity. Proponents of this view cite two reasons for the change: the decreased importance of the most influential products or companies, and disintegrating product life cycles resulting from increasingly modular systems. With those factors having less and less impact on spending, they contend, economic change will have more.

But not quite yet. IDC instead still maintains that the bulk of purchase decisions in the short term will be made on criteria other than the economic outlook. We note several points that highlight the state of the economy-industry relationship:

- **Product introductions remain the critical determinant of industry expansion.** Particularly on the high and low ends. The introduction of the IBM PC in 1981 and 80386-based PCs in 1986, for example, produce startling spikes in PC growth that are unrelated to changes in economic activity. Introduction of the S/370, 303X, 43XX, 308X and 3090 clearly precipitated renewed buying activity wholly unrelated to economic up- or downturns.

- **Market segment age** has a double-edged impact on susceptibility to economy-inspired cause and effect. Newer, high-growth markets are essentially impervious to changes in economic activity. Vi-

PC Product Cycles and Market Growth
(Source: International Data Corporation, 1990)



This chart shows the importance of PC cycles to market growth. For other industry segments see pp. 4, 5.

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able yet mature market segments may be somewhat susceptible to economic change, but older market segments that have been superseded by newer technologies cannot be resuscitated by a brightening economic picture.

- **Otherwise, no direct correlation** between computer spending and changes in GNP can be discerned from 20 years of data: either across the board, by IDC size class, or within specific market subsegments.

- **However, common sense indicates** that if the economy slows, less money is available for computer purchases. Simple. One explanation of the lack of correlation is that product cycles and price performance drops outweigh all but the most severe economic changes. As long as the industry is characterized by radical new price points and by revolutionary product introductions — which produce high growth in at least some market segments — most economic swings will be relatively unnoticeable.

The computer industry still maintains a healthy indifference towards general economic trends. There is no clear correlation between economic outlook and spending patterns. Change in hardware spending appears to be much more closely tied to the relative newness of an industry segment, product class, or technology, and to product or introduction life cycle.

IDC expects that computer industry growth *will* exhibit greater correlation with changes in economic activity in the future. We cite two contributing factors:

- **Replacement sales:** Replacements comprise the bulk of *all* systems sales (approximately 90% of large-scale, 70% of medium-scale and 50% of small-scale systems), and are growing. As hardware — in the mind of CFO's — becomes more like capital equipment, IS budgets will more closely resemble eceonomic trends.

- **More rapid life cycles:** As the pace of technological advancement of new product introductions quickens, the effect of *any single* new product becomes less visible. That reduces the effect of pent-up demand (which produce the downward slope that preceded the Macintosh and '386 PCs). And to the extent that users can accomodate these shorter cycles, economic factors play a more important role in IT growth.

Looking for Economic Cause and Effect

Stripping out the effect of market segment "newness" and product life cycles is one way of isolating the impact of the economy on hardware purchase decisions. But that's easier said than done.

On the high end, life cycles of IBM large-scale systems have been the preeminent determinant of industry fortunes since the introduction of the System/370 (chart, p. 5). Upon general availability of IBM's new products, large-scale system revenue growth typically skyrockets to the 20-30% range for a year or two, and then retreats.

On the low end, technology turnover — from 8088 to 80286 to 80386 and beyond — produces successive waves of spending and retraction. Any effect of the '81-'82 recession, for example, is masked by the huge swell of single-user system sales inspired by the introduction of the IBM PC in 1981.

In both cases product introductions — performance and functionality at new price points — are the dominant driver of growth.

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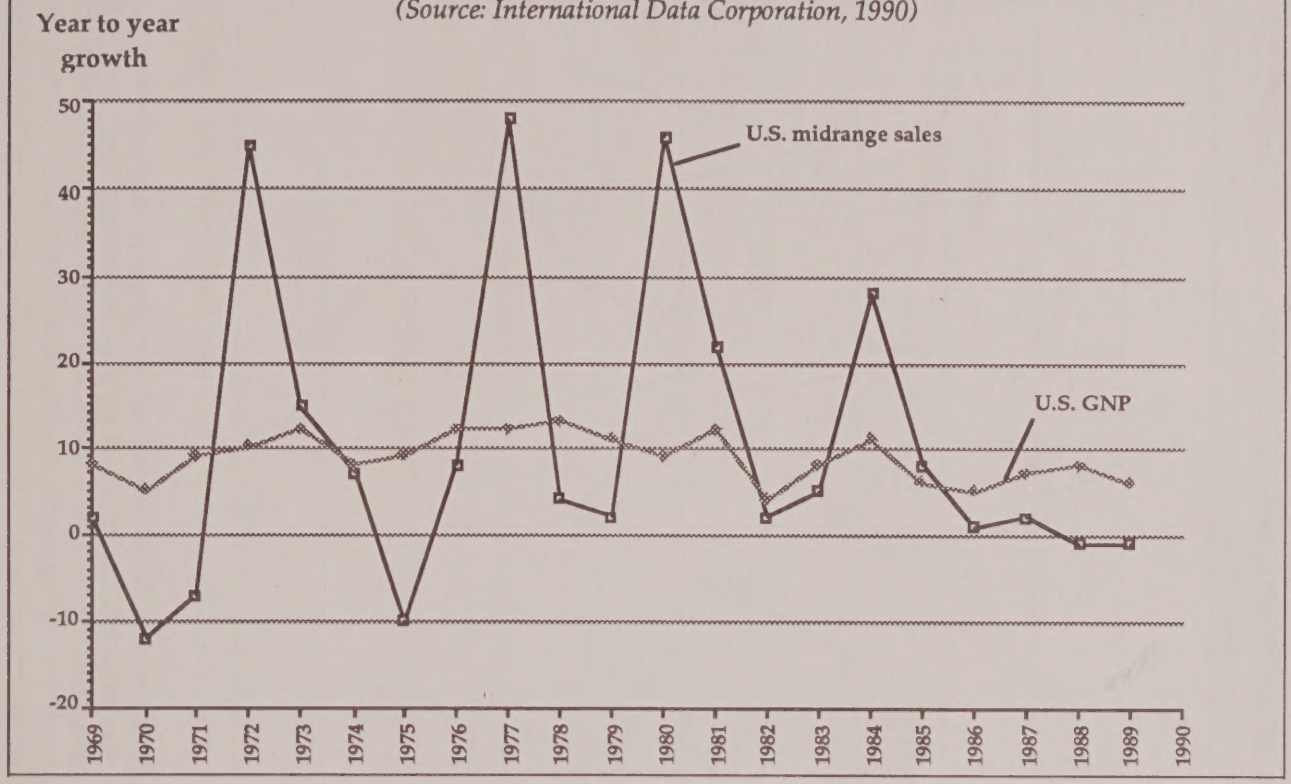
The Midrange Buying Frenzy: Percent Change in Small- and Medium-Scale Systems Sales ($) and Nominal U.S. Gross National Product

(Source: International Data Corporation, 1990)



The effect of steady price-performance drops outweighs other factors.

That leaves the midrange, a market clearly dominated by fairly regular periods of growth and retrenchment. A midrange buying frenzy appears to hit from between 12 to 24 months before an economic downturn (see chart, p. 3). What's more, neither of the first two peaks can be explained by product introductions. One theory goes that MIS managers, sensing danger, buy up capacity before finance nixes additional purchases during the downturn. Until this year, anyway.

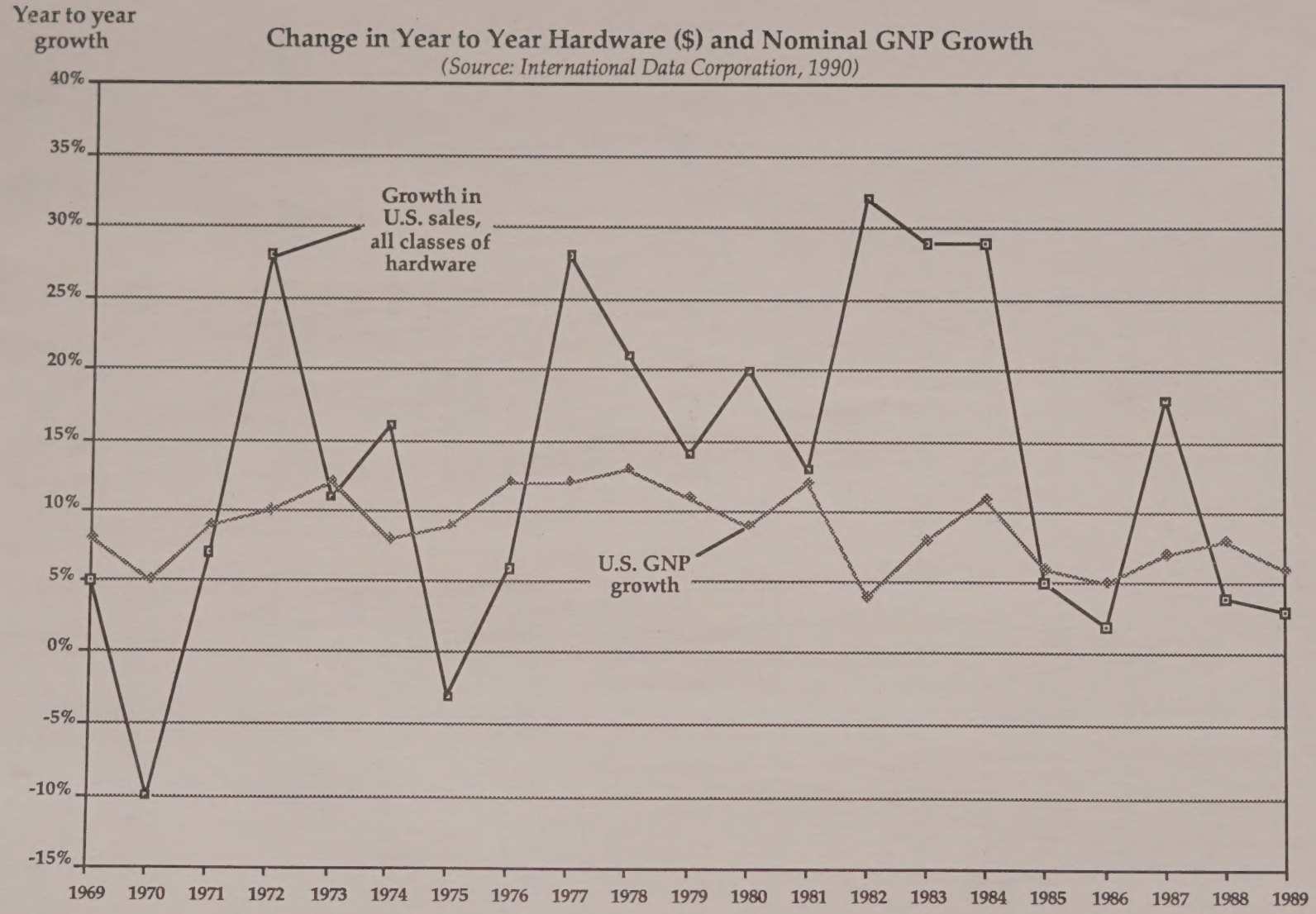
Right now the market segment is in such bad shape because of the growth of alternative technologies — networked PCs and workstations — that any economy-inspired effects are dwarfed. So, while it may appear that changes in the level of economic activity might have an effect on midrange growth, the data do not lead to any sure conclusions.

Forecasting on the Economy — Why Bother?

The computer industry is maturing; it is not yet mature. Until it is, IDC does not believe that any strong positive correlation between economic activity and general industry health exists. Product announcements and segment growth combine to mask all but the wildest changes in economic activity.

That's different from saying the two aren't related. The question then is, in which cases do multiple factors stack up just right such that computer spending closely follows GNP activity?

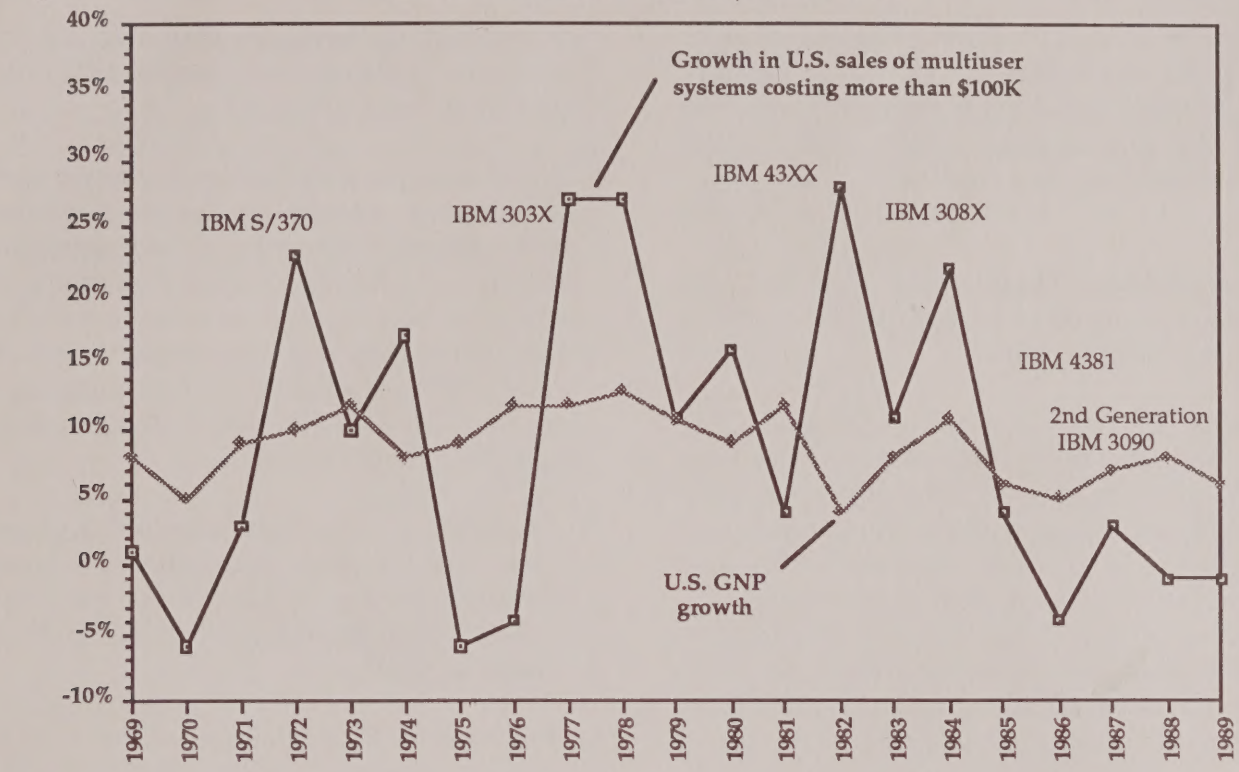
Because of the difficulty of that task, IDC's forecasts continue to be economy independent. Predicting the fortunes of the world economy is risky business for technology market watchers. Particularly when there appears to be no strong correlation between economic outlook and hardware spending.



The three charts on these pages depict the relationship between changes in U.S. nominal GNP and U.S. computer hardware buying patterns. Every apparent positive correlation in industry-wide spending (on this page,) is contradicted by a period of negative correlation. For example, between 1969 and 1973 the curves are somewhat positively correlated. Between 1979 and 1984 a highly negative correlation exists. Looking at specific industry segments, on the facing page and on page one, merely highlights the importance of product introductions. On each chart, any effect of GNP change is outweighed by the effects of lower price-performance and by the relative age of the market segment.

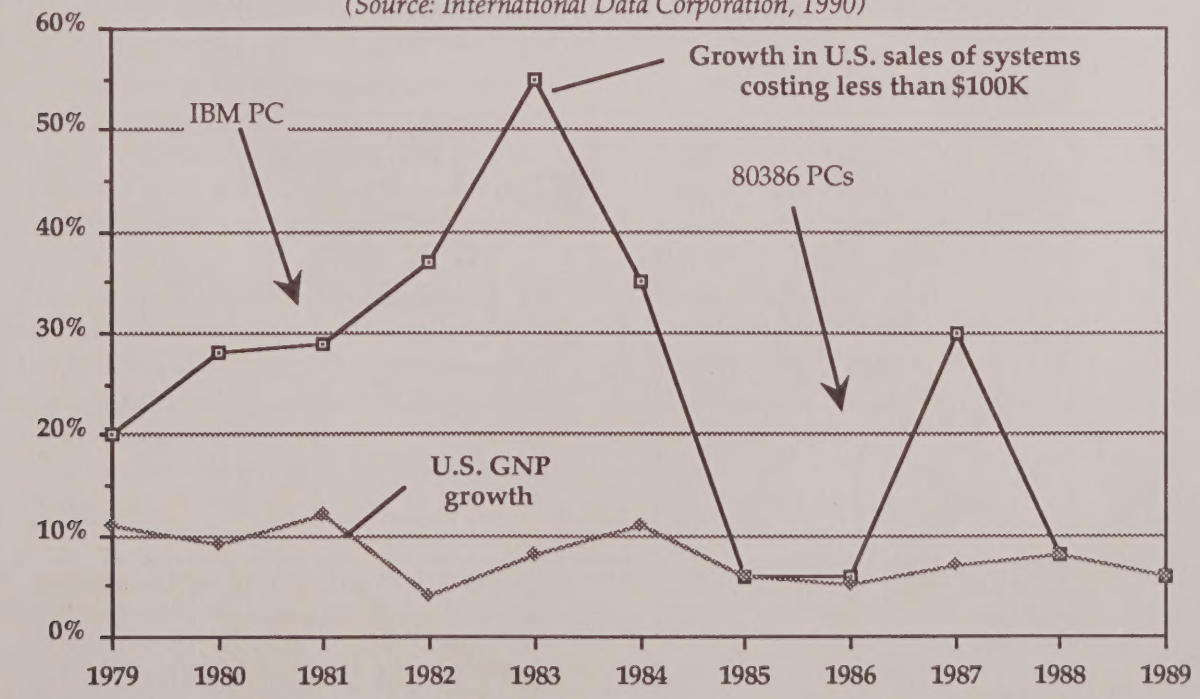
Change in Year to Year Large Systems ($) and Nominal GNP Growth

(Source: International Data Corporation, 1990)



Change in Year to Year Small Systems ($) and Nominal GNP Growth

(Source: International Data Corporation, 1990)



NeXT's New Cubes: The Puzzle Is Still to Sell Them

"At bottom, NeXT's success may boil down to this: can Jobs build a cost-effective and reliable distribution system before the Apples and Suns can cost-effectively and reliably integrate new technologies into their systems?"

—*GS*, 24:9, October 28, 1988

You might say chapter one on NeXT Computer has closed — except that chapter two has the same storyline.

When the first black cube rolled off the line late in 1988, NeXT Computer was preaching "Unix for the masses." The cube — and the NextStep development environment — was supposed to give end users incredible new application development productivity. Unencumbered with an outdated architecture, NeXT planned on whisking customers into the newest and best commercial workstation platform.

Initial response to the first generation NeXT machines was lackluster at best. Customers said the systems were slow, overpriced, and lacking color. "Besides that they loved them," Steve Jobs jokes.

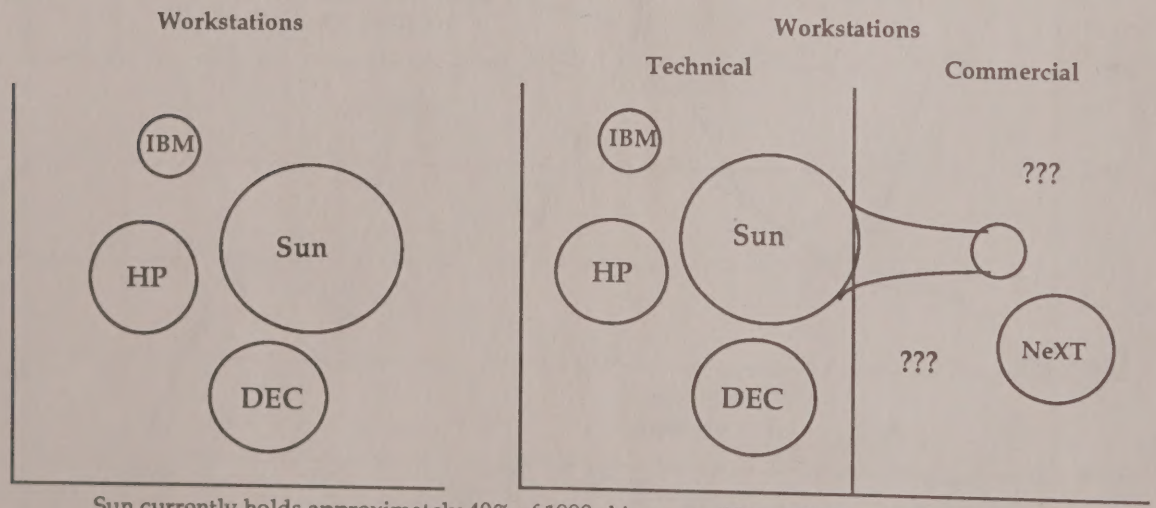
NeXT went back to the drawing board and has gotten its product line in order with the late November shipment of three impressive 68040-based systems. Now management is asking for two to three months to get the sales, marketing and distribution end of things in order. But, as the above quote suggests, NeXT's most serious challenges may not be technological at all:

- To existing workstation companies, growing a commercial workstation business means growing from a technical base. Because NeXT has none, its challenge is at least doubled.

- Nor has NeXT established means for getting systems into customers' hands; its competitors have hundreds of direct sales personnel, proven successful relations

The Nascent Commercial Market: Workstations According to NeXT

(Source: NeXT Computer, 1990)



Sun currently holds approximately 40% of 1990 shipments (37% of '89 shipments) of the traditional workstation market, left. NeXT feels the market is actually two distinct segments with relatively little in common. Commercial workstation users might be publishers, medical firms, or financial services companies. To date, NeXT claims Sun is the only technical workstation vendor competing in the commercial workstation market. IDC notes, however, that both Digital and IBM are strong contenders here.

with ISVs, and proven relations with VARs and systems integrators.

Despite perhaps the slickest user interface, the easiest-to-use networking, and about a one-year jump in next-generation applications like Lotus's Improv, NeXT still faces an uphill battle. A year's lead in technology can be deceivingly short. Companies like Sun and Apple can slam the window of opportunity shut as hard as anyone.

NeXT will ship about 2,500 of the new workstations by yearend. IDC believes NeXT must sell approximately 50,000 units in 1991 to remain a viable workstation competitor. It is, apparently, already well on the way with a backlog of "over 20,000" firm orders, according to Jobs. As WordPerfect, Adobe and others bring new applications to market that highlight the features of the new NeXTs, that daunting goal will prove to be difficult, but reachable.

The NeXT Commercial Workstation Market

What kind of user might want a NeXT computer? NeXT claims to have discovered a basic schism between commercial workstation users and technical workstation vendors. NeXT sees the emergence of a commercial workstation market that demands multitasking, better networking by "an order of magnitude," and a simpler, more efficient application development environment.

NeXT claims to have encountered only one other workstation vendor in the commercial segment: Sun Microsystems. IDC's research concurs. Sun has approximately 53% of the market for economic and financial modeling, and 67% of the "other commercial" applications segment.

Where's IBM and OS/2? A good question. Either NeXT and IBM are talking about different commercial accounts, or NeXT is only talking to companies that have bitten into Unix. Either way, both Digital and IBM will be strong contenders in 1991 and beyond.

The Emerging Marketing Organization

To drive products through that schism, NeXT is fortifying its sales and marketing organization:

Direct Marketing

- Rapid expansion of the direct-to-Fortune-500 sales force from 75 to 150 within six months.

- Development of blue chip reference accounts and growing reference accounts by sending key developers to NeXT camp in order to learn and preach NextStep.

Dealer Channels

- NeXT has all but indicated that its relationship with Businessland is through. As a result it will rebuild a dealer channel starting pilot projects with selected dealers rather than broad horizontal programs.

- NeXT is working to build relationships with system integrators. Andersen Consulting was a key partner in winning the First Boston bid.

Low-Tech Challenge: Building Distribution Channels

Building a solid distribution and support system is the company's number one challenge. Unfortunately for NeXT, Steve Jobs — the company's, if not the industry's, finest salesman — cannot visit every account. Building an organization that can is easier said than done.

And High-Tech: How Good *Is* NextStep?

Nextstep is the company's most important strategic product. Its long-term viability hinges on how well NeXT can leverage and sell its benefits. NeXT gained immediate

— continued on p. 8

F Donald Bellomy

Motorola announced v
the 68040 microprocessor, but a day later Apple announced it was forming a RISC joint venture with Acorn Technologies and VLSI Technology, casting doubt it would use Moto's 88000 RISC processor in next-generation Macs. Demand for the 80486, from HP and NeXT, is huge. Not so the 88K — maybe. It had, and probably still has, the inside track at Apple since the new joint venture seems to be aimed at making embedded controllers, printer controllers and notebook-only chips.

Businessland's new COO Edward Simon announced a reorganization "along the lines of a traditional computer systems supplier," which, in light of the malaise afflicting "traditional computer systems suppliers" seems strange. The company was divided into Distribution, Service, General Products, and Network Systems divisions. About the only thing really new is that Network Systems will offer vertical applications, consulting and facilities management to big end-users.

Siemens (51%) and StorageTek (49%) merged printer operations to form the third largest high-speed, high-performance printer company in the United States. It will be operational in January, 1991.

Reports that the French government spied on IBM and Texas Instruments between 1987 and 1989 to funnel secrets to Bull was corroborated by a senior FBI official appearing on the PBS show "American Interests."

Notebook PCs dominated Comdex '90. Notebook markets (see *GS* 26:4-5) are displaying commoditylike behavior almost overnight. Most featured VGA screens from Epson, Sharp, and Citizen; 2.5" 20MB and 40MB hard drives from Conner, JVC and Prairietek; 80286 chips from Intel or AMD; and 80386s from Intel. With little product ess is tied to price, brand image, distribution, and supply. IDC figures AST, Epson, TI and Sharp — and to a lesser degree Everex, Librex, Samsung and Packard Bell — will be the strongest contenders to win some market share alongside current leaders Toshiba and Compaq. It's a safe bet that by mid-1991, about the time IBM rolls out its notebook, there will some kind of market shakeout.

NeXT, cont.

credibility by licensing NextStep to IBM. Now, IDC believes, IBM is selling NextStep on 10-15% of the RS/6000s it sells.

Application developers from Lotus and WordPerfect are quick to sing NextStep's praises. While stopping short of saying exactly how much development time was cut, or how far ahead NextStep and the new systems are, they are unanimously exuberant in their praise. Application developers at Lotus, for example, indicate that NextStep's user interface actually helped them visualize and deliver a truly revolutionary product. They claim Nextstep made them better program designers.

Perhaps the most compelling aspect of NeXT's argument is the contention that commercial workstation users all want to develop at least one unique application. That, NeXT says, is where NextStep shines. The company claims that once MIS users see the ease with which they can develop with NextStep, they won't want to use anything else.

Since end-user application developers are likely to benefit more from NextStep than are professional application designers, the question is simple. Is NextStep good enough to stave off Sun, HP and Digital while NeXT hits the ground?

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STORAGE REVIEW AND FORECAST
Computer Industry REPORT

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Disk Directions: More Dips, Dives, and Drama

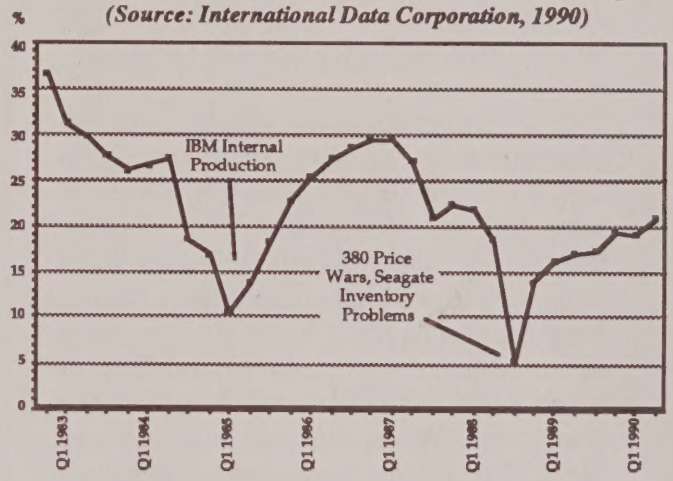
New rules are producing leaner, more competitive suppliers as OEM disk drive companies manage faster product transitions and fragmented end-user markets

Cyclical, commodity, countercyclical, schlocky — all have been used to describe the OEM Winchester hard disk drive (HDD) industry. But few other industries deliver healthy growth and clear-cut entrepreneurial opportunity.

Nowhere else in the computer industry does supply-and-demand tension fuel such frequent swings between supplier prosperity and poverty. Customer loyalty is limited, overshadowed by time to market and product availability. Overnight technological obsolescence and a customer preference for two sources of supply contribute to low margins. As a result, HDD prices are dropping at roughly 20% per year.

The ten-year history of the small Winchester industry is marked by three distinct down cycles: June of 1984 to June of 1985 after Seagate and others lost IBM business, the 12 months starting at the end of 1985 when PC demand dropped through the floor, and between June of 1988 and March of 1989 coincident with heavy 380MB discounting and when Seagate was offering aggressive promotions to distributors.

Winchester Industry Composite Gross Margins
(Source: International Data Corporation, 1990)



How is the industry positioned today? Systems demand is shaky and the threat of a manufacturing capacity buildup is ever present. Vendors are making a generational transition, this time to two- and three-inch drives. Two companies — Seagate and Maxtor — are in the midst of integrating acquisitions, and several suppliers are making investments in new capacity.

A clear divergence in performance — between companies with margins near 25% and those under 20% — was reflected in September financial results. And the supply-and-demand dynamic continues to push and pull. Consider these HDD constraints and boosts:

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IDC INTERNATIONAL DATA CORPORATION
5 Speen Street, Framingham, MA 01701 / (508) 872-8200

HDD Demand

- **Systems demand is the single most important determinant of HDD sales.** Roughly 90% of all computer systems are shipped with a Winchester drive. Worldwide computer systems unit growth is in the 9-10% range.

- **End-user markets are splintering** into a dozen fragments: palmtops, notebooks, laptops, portables, desktops, fanless desktops, workstations, servers, arrays and multiuser systems. Each demands slightly different products based on power consumption, weight, capacity, form factor, price, performance and reliability.

- **The aftermarket — upgrades and replacements — is alive and kicking.** In fact, it's something of a savior. When PC sales fell in 1984, millions of floppy-based PCs were retrofitted with hard disk upgrades. Replacement sales should keep the aftermarket healthy. Compared to an average computer system life of seven years, HDD's expected life is about four years. When systems fail they are fixed. But when drives and controllers fail they're often replaced.

- **Worldwide demand for network file servers will rise,** from 6% of the HDD market in 1988, to over 20% in 1993.

- **From SLEDS to RAID.** Single, large, expensive disks are giving way to redundant arrays of inexpensive disks. Applications demanding huge amounts of larger-drive storage systems will slowly move to assemblies of smaller 5.25" and 3.5" HDD systems.

- **Long-term demand** for new HDD applications, such as drive arrays, fax machines and printers, will slowly augment system demand. Palmtops and other consumer applications could eventually drive demand for new 1.8" HDDs.

HDD Supply

- **Winchester vendors will ship approximately 24 million 2.5", 3.5" and 5.25" HDDs in 1990.** Unit shipment growth between 1989 and 1990 is approximately 23%; between 1990 and 1991, it will be approximately 18%.

- **R&D projects started in the last two years are coming to fruition.** The result: a dizzying variety of second- and third-generation 3.5" drives will shortly become available (see p. 8). Older generations of 3.5" and 5.25" products will face demand slowdowns.

- **Component availability problems** could limit the availability of newer technology products.

- **Prices are cost-, not value-, based.** And prices are declining, on the average, by 20% across market segments.

- **Technological substitutes will begin to hit the market in 1991.** Inexpensive, versatile technologies like 16MB flash RAM are appealing alternatives for laptop and notebook applications and may, in the long term, pose a more significant industry threat if they become cost competitive.

Is a fundamental restructuring under way or imminent? Is there a more efficient structure for the manufacture and supply of Winchester hard disk drives? How will these forces combine to reshape the industry?

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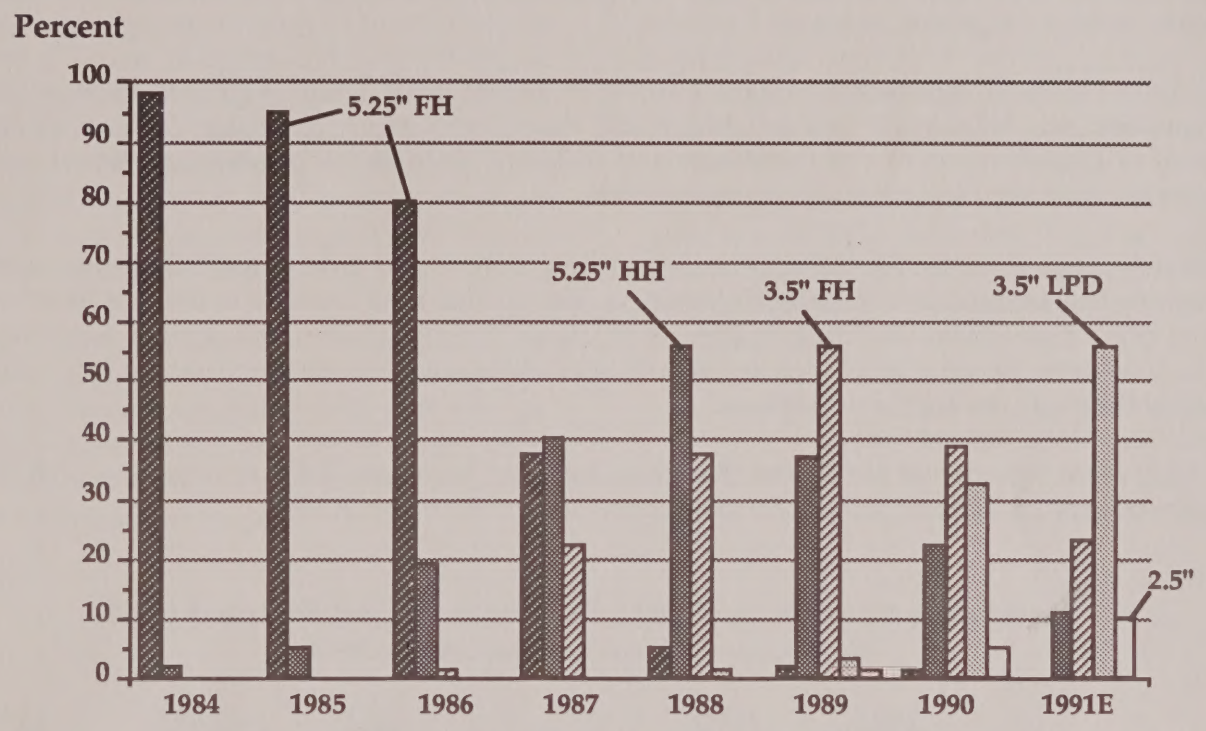
Percent of Worldwide 40MB Winchester Shipments, 1984-1991 — 2.5", 3.5", 5.25" Form Factors

(Source: International Data Corporation, 1990)



FH = full height, HH = half height, LPD = low profile drive

International Data Corporation, publisher of the ***Gray Sheet***, believes the disk drive industry will experience solid growth in the next 24 to 36 months. Growth will be focused in high-capacity 2.5" and 3.5" drives.

However, overcapacity in older 3.5" markets may arise in the next 12 months (see p. 10). Some vendors will be at greater risk than others. How they manage the transition to 2.5" and third-generation 3.5" products will largely drive their ability to compete in OEM disk-drive markets.

Industry leadership changes mirror market dominance. As smaller disks have grown to comprise the bulk of overall shipments over the last two years, new leaders have emerged. Seagate and Micropolis were technology and market share leaders in 1987. Today, Conner and Quantum are driving the industry. But that is not, by any means, the extent of industrywide change.

Reshaping the Industry

The conditions that created Winchester markets — interoperability, differentiation on cost-based pricing and quality (mean time between failure) — now portend basic change in the structure of the industry. OEM HDD markets have already gone through one phase of consolidation. Another period of retrenchment is now likely. The password is oligopoly.

Many believe the industry is moving toward the establishment of a few very large, dominant vendors. Great size and resources would allow them to execute on product

— continued on p. 5

Newer Tape Technologies Fragmenting User Base

Since 1984, the most distinctive aspect of tape storage technology was its dominance by platforms based on 3M's early-'80s DC600 and DC2000 design. The recent growth of 4- (digital audio tape — DAT) and 8-millimeter tapes represents a generational leap in capacity, and is threatening the tape status quo.

But not without problems. Software to run 4- and 8mm drives, largely ignored by tape-drive manufacturers, belongs to resellers. As a result, they control tape-drive sales. And a confusing array of combinations of tape hardware and software designed to provide individual solutions are creating a fragmented end-user market.

Slowly, tape software for the smaller form-factor platforms is emerging. Palindrome, which markets backup solutions for Novell networks, has teamed with Exabyte to debut a new 8mm tape drive that attains searching speeds as much as 75 times faster than existing technology. The new 8mm product addresses key weaknesses of its predecessors compared to 4mm products selling into the LAN marketplace.

Still, 8mm tape drives are slower than their 4mm counterparts. IDC's Storage Research Program targets 2.5GB 8mm tape-drive market growth at 29% through 1994.

Worldwide 4mm, 8mm, DC600, DC2000 Tape Unit Forecasts (000)

(Source: International Data Corporation, 1990)

	1989	1990	1991	1992	1993	1994
4mm 1.3GB	5	35	70	120	180	200
4mm 4-5GB	-	5	25	40	70	100
8mm 2.5GB	49	93	165	185	200	175
8mm 5.0GB	0	2	30	75	100	150
DC 600						
60MB	335	120	70	20	-	-
150/250MB	365	575	400	300	150	50
320/525MB	2	50	100	200	225	275
1.35GB	1	20	80	125	180	200
2.7GB	-	-	-	5	35	70
DC2000						
20MB	40	20	5	-	-	-
40/60MB	420	410	325	250	175	100
80/120MB	100	340	490	575	550	525
320MB	-	-	45	120	200	250

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cycles more efficiently and more quickly than smaller competitors.

The development of oligopolistic conditions can happen through industry consolidation: actual mergers and acquisition, or "soft consolidation." Examples of the former include Siemens' decision to exit the Winchester business, Seagate/IMPRIMIS and Maxtor/MiniScribe. Further acquisition activity is possible, although fewer logical combinations remain.

A softer consolidation is inevitable. Companies will focus on specific market segments. Fewer companies will play the all-things-to-all-people line. As a result, competition in various market segments will occur among fewer players.

But an OEM disk drive oligopoly will be established within a single truth of Winchester markets: the combination of very scalable entry barriers and weak customer loyalty still represent an opportunity for well-managed start-ups. Conditions are still ripe for another Conner.

Indeed, start-ups with plans for 1.8" products are already receiving funding. And Asian competition can certainly clear the low and lowering entry barriers as well as anyone.

— With Jay Bretzman, Crawford Del Prete, Alexa McCloughan, and David Vellante

Optical Storage: Technology in Search of Solutions

Generational transition, increasing aerial density, and skyrocketing function dominate more than the magnetic Winchester hard disk drive markets. They pertain to optical disk drive markets as well. However, optical media manufacturing is still in its infancy. And movement up the learning curve probably will not be significant for another three to five years. As a result prices are high and shipment volumes are low. Until the pace of technological change slackens, media producers will continue their reluctance to reduce cost/MB by ramping production.

Without any unique advantages besides removability, rewritable optical storage is dependent upon sophisticated software to find a niche in the data storage hierarchy. One such application is direct access secondary storage (DASS) produced by companies like Epoch Systems, HP, QStar and Zetaco.

Worldwide Magnetic Optical Drive Shipments, Value of Shipments and OEM ASV

	1989	1990	1991	1992	1993
Shipments (000)	38,850	77,600	104,550	119,000	100,950
OEM ASV ($)	2,400	2,000	1,600	1,300	1,075
Value ($M)	93,240	155,200	167,280	154,700	108,521

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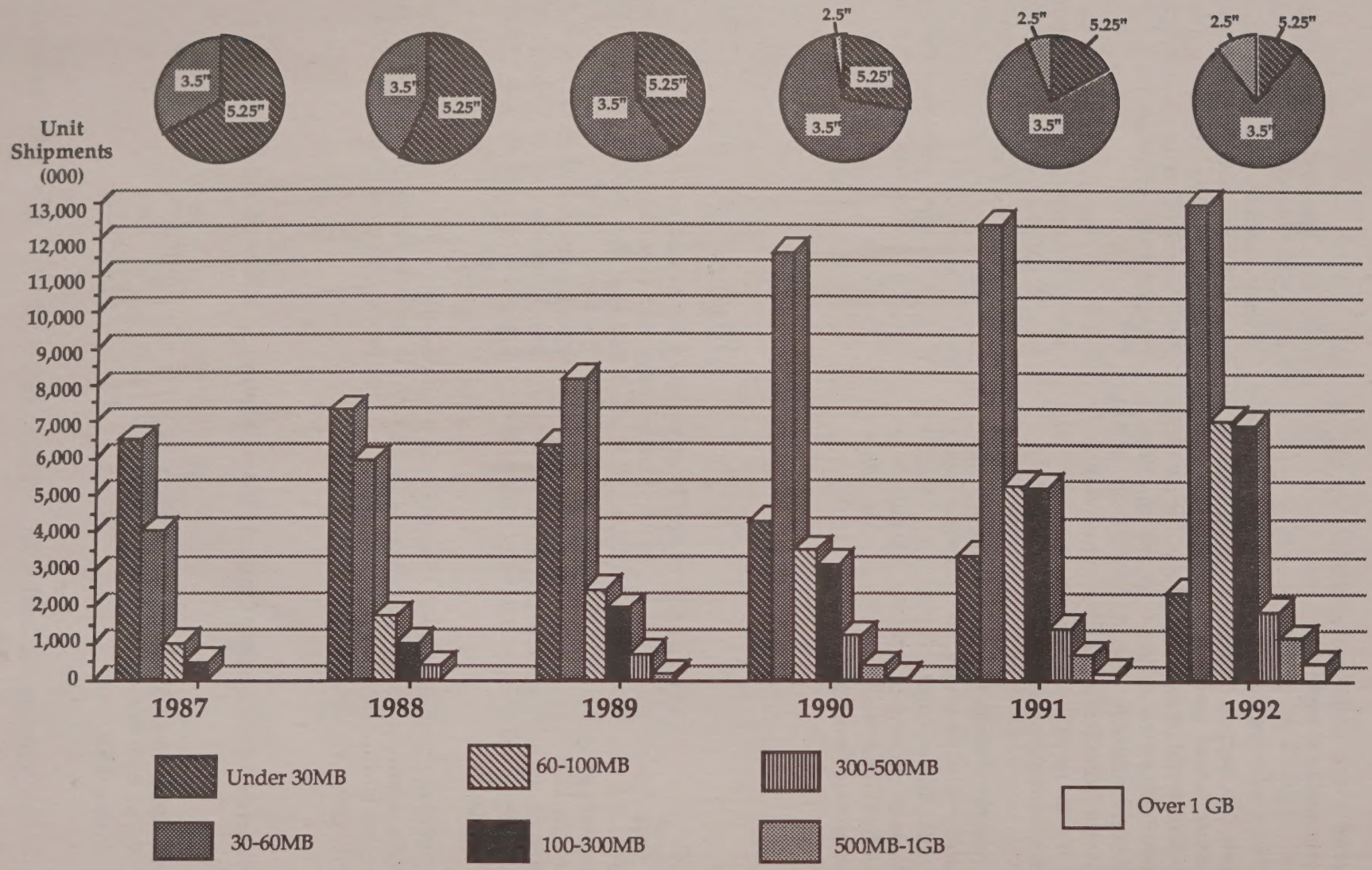
Shift in Mainstream Capacities and Form Factors

Worldwide Winchester Unit Shipments



Worldwide 2.5" Hard Disk Drive Shipments (000)

(Source: International Data Corporation, 1990)

MB	1987	1988	1989	1990	1991	1992
< 30	-	-	32	420	900	750
30-60	-	-	-	30	1,000	2.600
60-100	-	-	-	-	255	1,250
>100	-	-	-	-	-	35

Worldwide 3.5" Hard Disk Drive Shipments (000)

(Source: International Data Corporation, 1990)

MB	1987	1988	1989	1990	1991	1992
< 30	3,053	4,343	4,800	2,650	1,700	1,525
30-60	902	2,172	6,145	10,100	11,100	11,000
60-100	1	368	1,225	2,650	4,300	5,950
100-300	20	120	855	2,150	4,350	6,250
300-500	-	-	35	202	775	1,200
>500	-	-	-	1	50	350

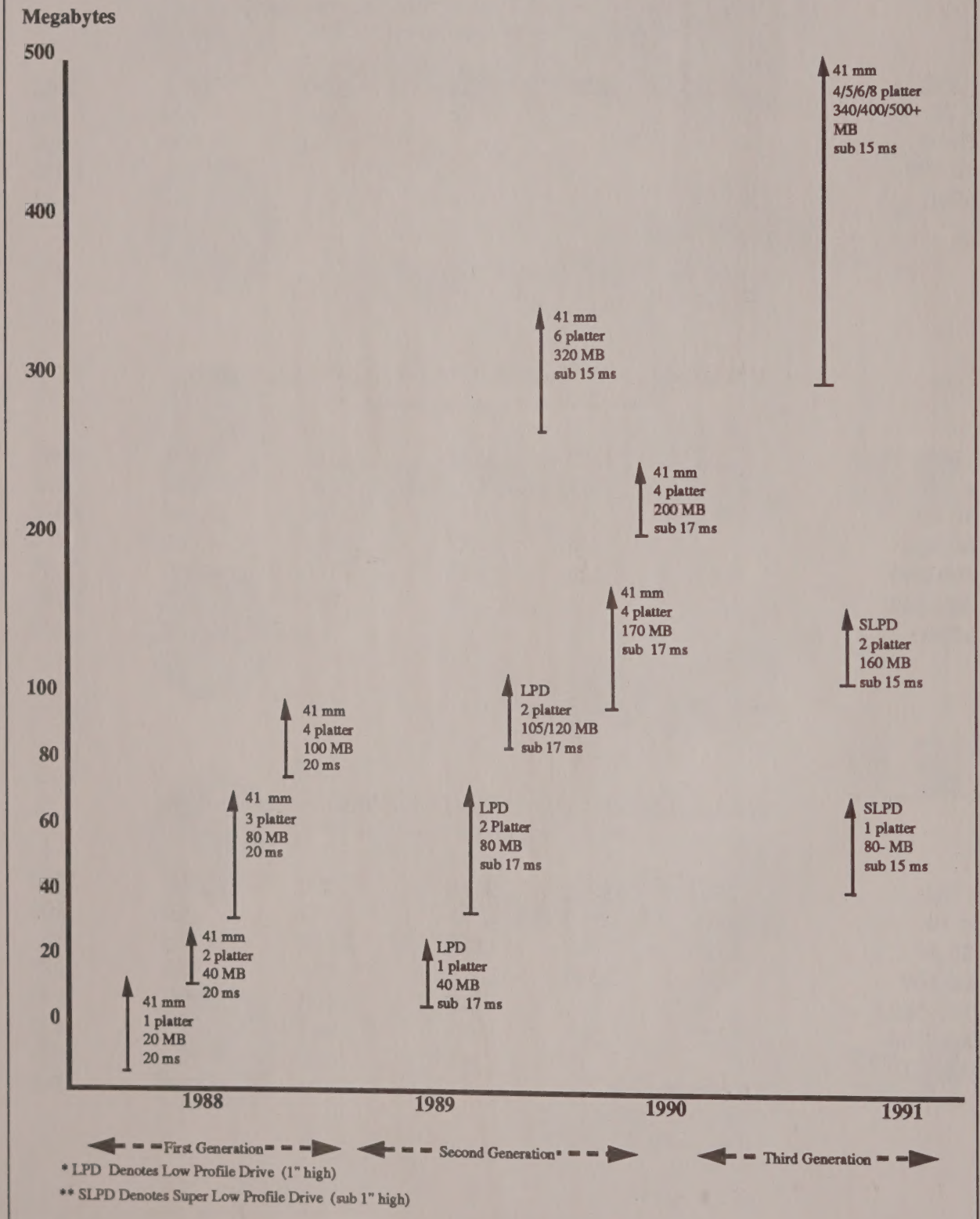
Worldwide 5.25" Hard Disk Drive Shipments (000)

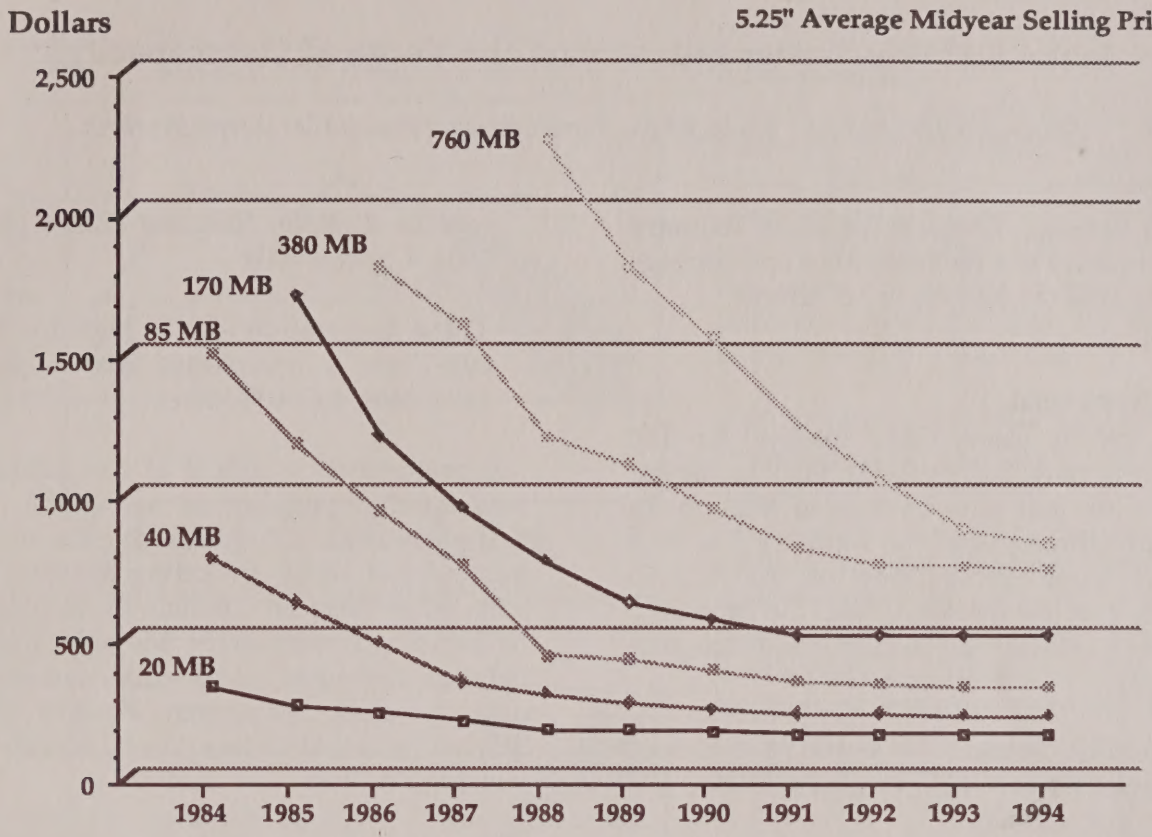
(Source: International Data Corporation, 1990)

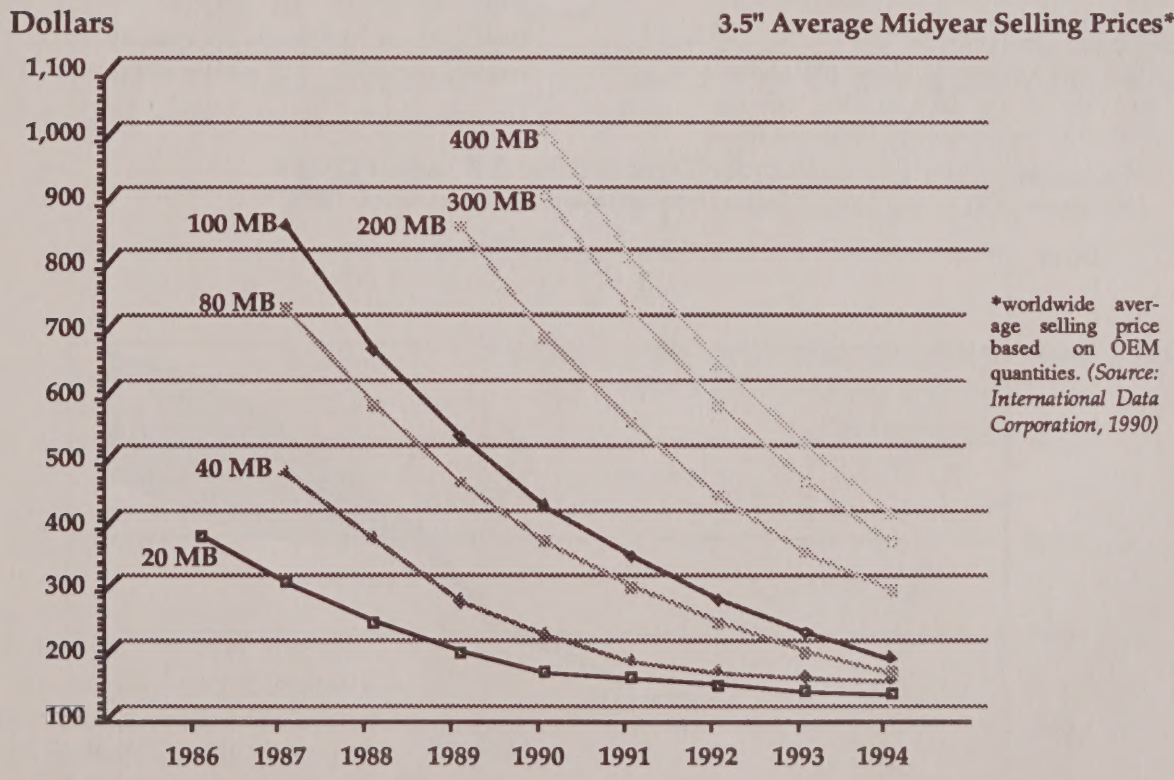
MB	1987	1988	1989	1990	1991	1992
< 30	3,430	2,940	1,775	1,090	300	100
30-60	3,100	3,719	3,268	2,375	1,255	500
60-100	1,006	1,356	1,170	840	555	275
100-300	435	874	740	660	475	350
300-500	20	367	658	943	931	650
.5-1GB	-	16	120	398	614	745
>1GB	-	-	2	80	269	540

Evolution of 3.5" Winchester Drives

(Source: International Data Corporation, 1990)







*worldwide average selling price based on OEM quantities. *(Source: International Data Corporation, 1990)*

Shorter product life cycles and more aggressive competition have steepened the decline of Winchester drive prices across all form factors. By 1994, the price of a 400MB 3.5" disk will approach the 1990 price of a comparable 80MB 3.5" product.

Is the 3.5" Winchester Industry on the Verge of Overcapacity?

Managing 3.5" and 2.5" product transitions will determine future competitiveness

IDC's Storage Program believes industry overcapacity is a problem for a specific segment of the market: older 3.5" drives.

3.5" Segment

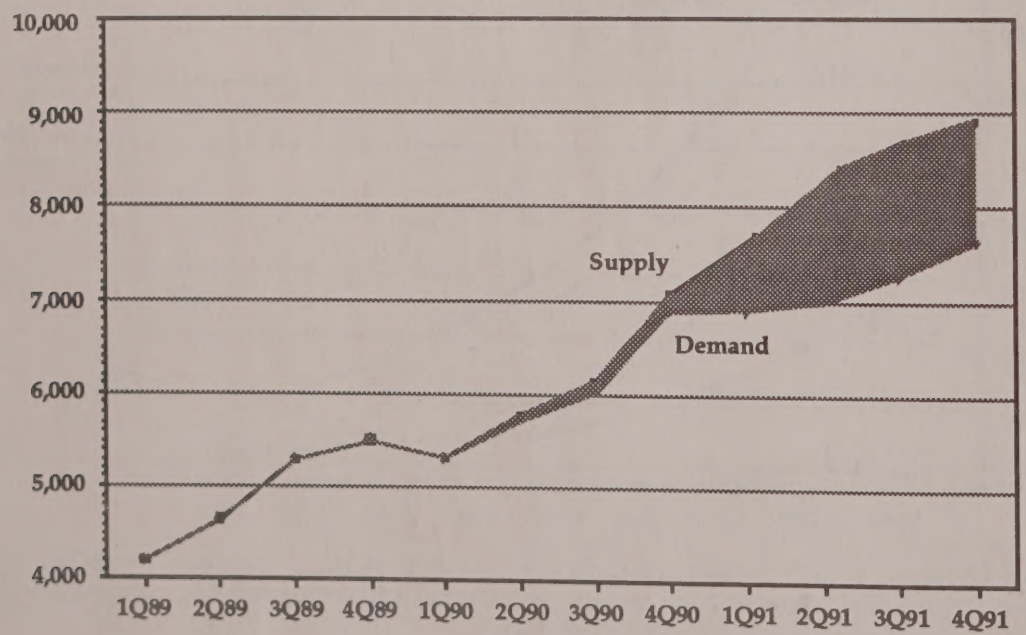
In recent years, R&D outlays for 3.5" products have been substantial. The investments are just now coming to fruition. In roughly three years, the industry has produced three generations of 3.5" drives which can be distinguished by capacity/platter, performance, and physical size; specifically:

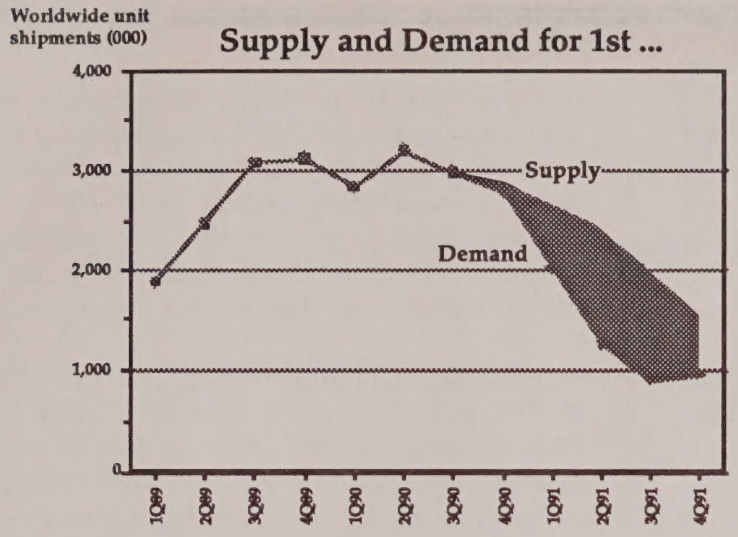
- **First Generation** — 41mm, 1-4 platter, 20ms drives with capacities of 20-, 40-, 80- and 100MB.
- **Second Generation** — 1" or .75"-high, sub-17ms, single platter 40s up to 2 platter 80s; 2 platter 105s and 120s; 4 platter 170s; 4 platter 200s
- **Third Generation** — 1" high (or less), sub-15ms, single-platter 80s; 2 platter 160s; 340s, 400, 500 MB+

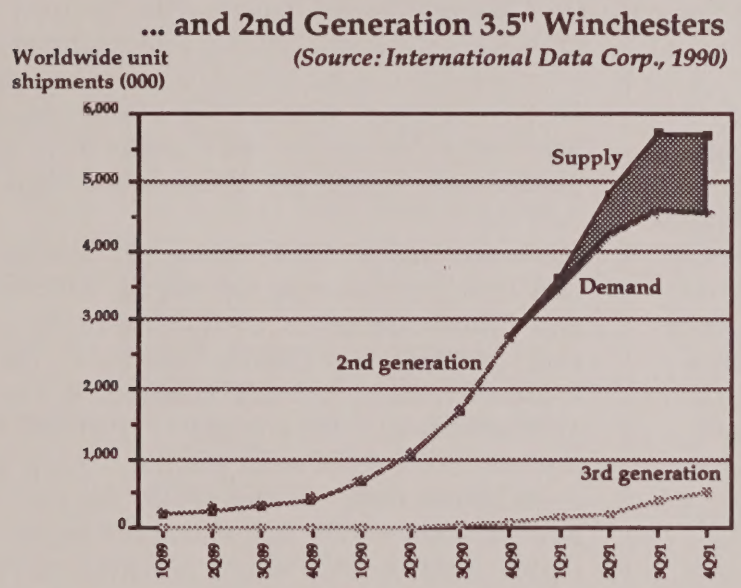
Approximately one-half of the industry's overcapacity problem is associated with first-generation 3.5" drives. We do not expect several firms, including Maxtor, Seagate, and Western Digital, to implement "end-of-life" strategies for this class of product until mid-year. Meanwhile, new fanless desktop computer-system designs favor drives that consume less power, and are one inch high or less.

We attribute an additional 2.5 million units of industry overcapacity to the second-generation 3.5" drive segment. The is-

Supply/Demand for All Small Disks
(Source: International Data Corporation, 1990)







sue here is new market entrants with inch-high 3.5" drives. As a result, we expect industry capacity to grow close to 60%, relative to slightly more than a 30% increase in demand.

Both third-generation 3.5" and 2.5" drives emerge from this analysis with supply and demand in balance; in fact, both markets are undersupplied. This is typical for the early stage of new technologies.

Conclusions

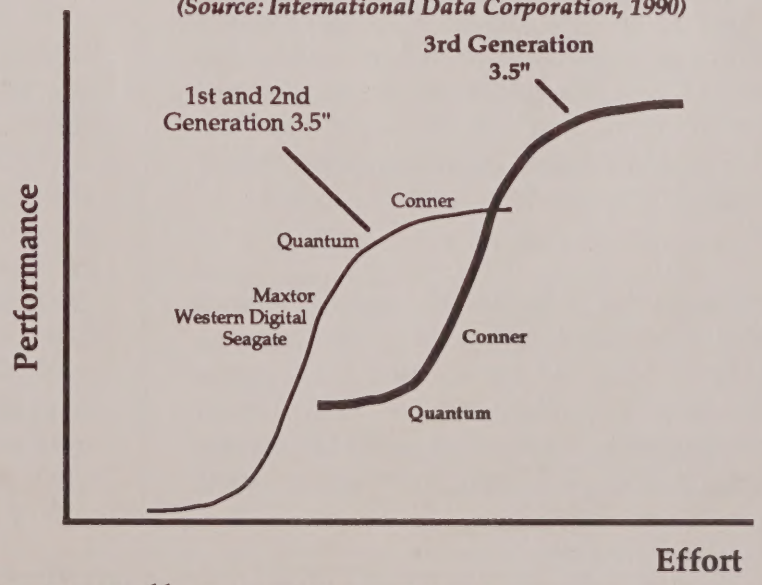
Much of the industry will be unaffected by 3.5" overcapacity. An individual company's vulnerability to overcapacity is a function of its exposure to second-generation 3.5" products and its ability to execute on third-generation 3.5" and 2.5" drives in the 1990-1991 time frame.

3.5" Technology "S-Curves"

Depending on age and complexity, investment in technology has different rewards. The "s-curve" portrays relative investment effort (financial, time commitment, etc.) and its likely payoff. Large efforts reveal little rewards early in a product's life. As the technology matures (moving from lower left to upper right), that same effort bears far greater rewards.

Older 3.5" drives are nearing the end of their product lives. Vendors of these drives are shifting resources to newer 3.5" products. While payoffs will initially come more slowly, they will eventually yield much higher rewards as the technology matures.

Technology "S-Curves": Positioning 3.5" HDD Companies
(Source: International Data Corporation, 1990)



RISCy VAX, really. Digital introduced the VAX 6000 500 Series, a powerful new VMS MicroVAX and multiple program announcements including the intent to enhance the VAX architecture with RISC technology, as the ***Gray Sheet*** indicated last summer, over the next few years.

Cray's XMS announcement is dominated by an aggressive 100% trade-in program designed to lock customers into the Cray architecture. Cray is on the verge of significatn international expansion. It will soon be announcing four XMS letters of intent from non-U.S. customers.

A Groupe Bull reorganization aimed at "refocusing the company's resources to confront the worldwide crisis facing the computer industry" will lay off 5,000 and shut seven plants. Bull's short-term concern is a return to profitability. Its long-term goal — to combine its proprietary operating system, GCOS, with Unix — will be funded through a multi-year contract with the French government. Star Wars, America's own hysterical undertaking, might start looking good to French taxpayers sometime around year three.

Intel's new multimedia chips cost under $100 per set, in quantity. Intel expects the chips will be included on PC motherboards (IBM?) as soon as 1992. After trotting out Moore's Law (transistor density doubles annually), Intel went on to imply that the whole design might be incorporated onto a single microprocessor, like the 80586, by 1995.

OSF/1 released. So what? The OSF gained some credibility by meeting its delivery schedule (delayed by swapping out some IBM core technology for the Mach kernel from Encore). But now it's up to OSF sponsors to put OSF products where their mouths have been. And strategic ones at that, like the the RS/6000, DECstations and systems, PA minis and Motorola workstations. Unless IBM, Digital, and HP announce (within six months) and deliver (within 18 months) these strategically critical Unix platforms, the OSF is a goner.

Workstation Updates: Digital announced a 23-31% price reduction on the DECstation 2100 and 3100 models, beating **Sun Microsystems'** Sparcstation IPC color workstation entry price of $8,995. **Solbourne Computer,** the most established Sparc-compatible maker, filled a product void by announcing the industry's first (for about a week) over 20MIPS desktop. The S4000 has 61% more MIPS and 20% more SPECmarks than a similarly configured Sun Sparcstation IPC.

Sun countered with the 28.5MIPS Sparcstation II line which is aimed directly at **IBM** and **Silicon Graphics'** dominance of high-end graphics workstation markets. The prospects? IDC's Technical Computing Program estimates DEC will ship 12,000 DECstations during the final quarter. That's a considerable ramp-up from 6,000 last quarter, and well above the 10,000-per-quarter magic number that seems to sway ISVs who rely on volume to make porting decisions.

Solbourne, meanwhile, is expected to ship less than 1,000 S4000s by year-end and might reach 10,000 per quarter by the end of 1991. Sun just keeps gaining momentum. The SS2 could enable Sun to usurp SGI's position as the industry's leading 3D graphics workstation vendor (in unit volumes) in 1992. **By the way:** the Sun booth at Unix Expo in New York last week was rather smallish, compared to the other workstation companies, but the Sunnies manning it were neophyte enough to profess ignorance when asked to explain.

THE GRAY SHEET
Computer Industry
REPORT

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The Eastern Europe Opportunity: Roadblocks, Reform, Real Long Term

Sizing computer markets is, in its most basic form, a straightforward task. You poll users, isolate vendors' hardware revenues, factor in things like new technologies, product-line expansion, upgrades and replacements, poll users again and, voila, instant (well, maybe not *instant*) market data.

Not so in Eastern Europe (EE). Decades of centralized economic planning, and barely a year's worth of *somewhat more open* markets, make sizing EE markets only slightly less difficult than moderating a round of GATT negotiations.

But with growth in the easy markets — the low-hanging fruit like North America and Western Europe — slowing, computer vendors are looking east for growth. International Data Corporation (IDC), publisher of the ***Gray Sheet***, has been scrutinizing Eastern European computer markets for over a year.

And why not? For a full 24 months, no region has received more gushing business press than Eastern Europe. Euphoria's contagious. The wall has fallen: grab the checkbook, make a couple savvy investments, sit back and the big bucks will start rolling in any minute now, right?

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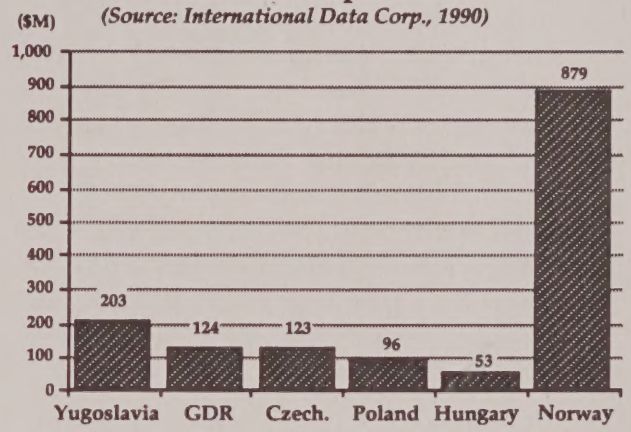
Value of 1989 Eastern Europe Hardware Shipments
(Source: International Data Corp., 1990)



Wrong. Creating demand for sophisticated computer systems — from scratch — isn't all fun and games. The economies of Eastern Europe — Yugoslavia, (the former) East Germany, Czechoslovakia, Poland and Hungary — are woefully deficient in an infrastructure that will support significant computer markets.

Nonetheless, IDC recently published the first comprehensive examination of the size and nature of Eastern European computer markets. Among its many findings:

- **The entire Eastern European region** — 140 million people and and a combined GNP of $815 billion (excluding Bulgaria, Rumania and the USSR) — comprised a $600 million computer hardware market in 1989. For comparison, Norway's was $879 million.

- **And that may shrink for a year or two.** Many of the countries surveyed will ac-

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tually experience contraction during the current reform period which is expected to last through 1991. Then computer markets are expected to grow at rates far higher than their western neighbors.

- **To make matters worse, currency valuation — devaluation, a-valuation? — distorts what little hard data exist.** Estimating the value of the installed base of Soviet- and Czechoslovakian-manufactured hardware is as much exchange-rate manipulation as market analysis. IDC has intentionally chosen a method of valuing East Bloc hardware that guards against undervaluation.

For all the hype in the computer trade and general business press, countries of the former East Bloc spend very little on computer technology — far less than their former governments claimed.

The opportunity is real: computer vendors looking for growth most certainly ought to look east. The image of a region ripe for growth is Eastern Europe's strongest allure for worldwide vendors. Despite the paltry current levels of spending, Eastern Europe will experience the world's highest growth rates over the next five years.

But the choice is not simple. The bewildering magnitude and pace of change in Eastern Europe will continue to frustrate computer-vendor attempts to formulate strategies to penetrate the growing markets. Eastern European markets are not a matter of low-risk investment in incremental sales. Success demands long-term commitment, investment and innovation.

Market Sizing: Within Eastern Europe

Yugoslavia is the dominant EE computer market. It accounted for close to 35% of the

Sizing Up Soft Markets: A Touchy Subject

Considering the difficulties of sizing and comparing markets — across economies and market systems dominated by inconvertible currencies and barter trade — it is appropriate to examine the reliability of these data. Indeed, 1989 was a year in which a large quantity of computer equipment was still being traded and exchanged among Eastern Europe producers and their clients — an amount far larger than imports of Western equipment into the region. Given this situation, market valuation hinges on how Soviet- or Czechoslovakian-produced equipment is valued when expressed in hard currency terms.

Although there are several ways to answer that perplexing question, IDC chose a methodology which guarded against undervaluation. And despite the fact that our data show the region's computer hardware markets to be relatively small already, IDC suspects that the markets may be slightly overvalued in our analysis.

In almost all cases we tracked 1989 shipments by Eastern European suppliers at the model level for each country, and thus we were able to assign values to average configurations of the various models. This was done by evaluating how the Eastern technology compared to equivalent systems shipped in the West at the time they were introduced, and adjusting the dollar value downward by as much as 40 - 50% for some models to account for the age and performance of the technologies involved. IDC believes this valuation method more relaistically captures the comparable value of shipments , rather than simple translation at either official or black market exchange rates.

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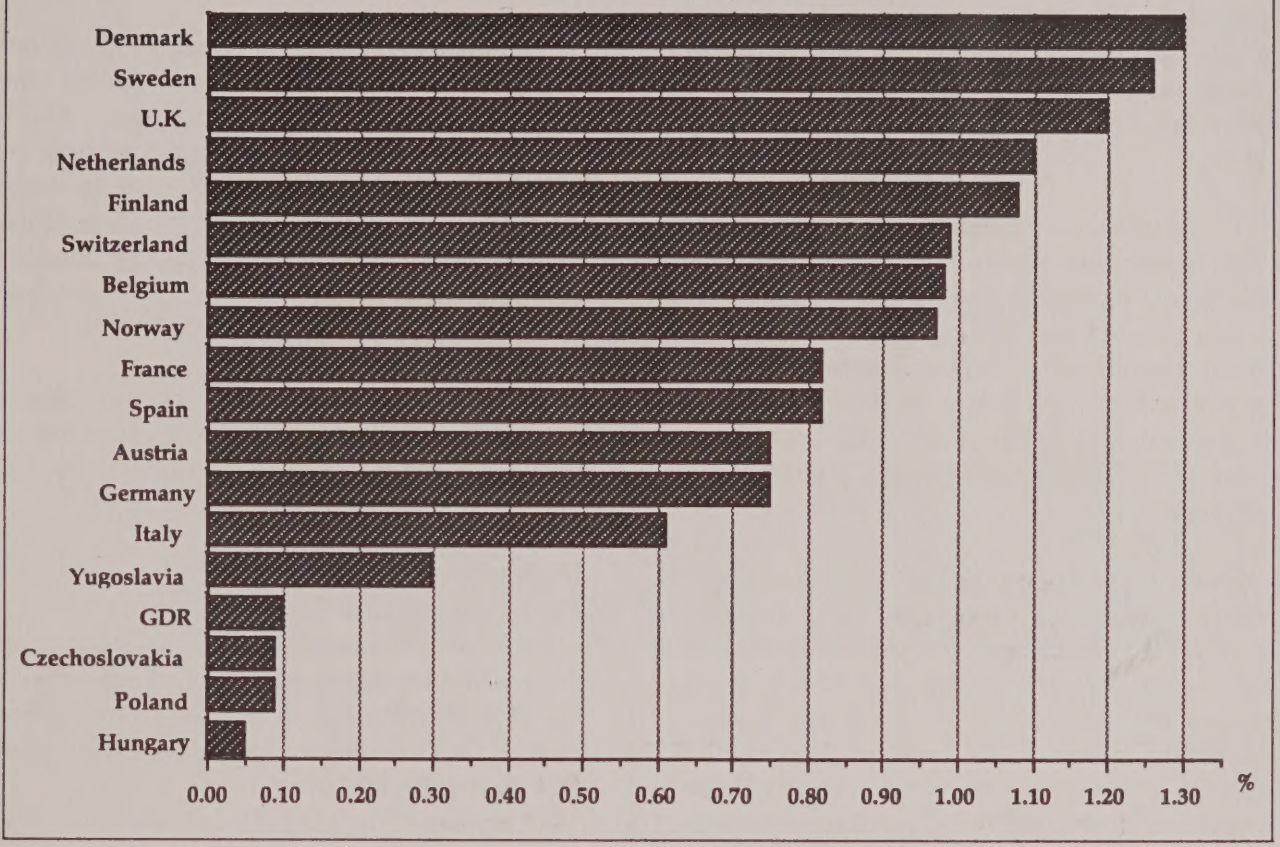
Eastern and Western European Hardware Spending as Proportion of 1989 GNP

(Source: International Data Corporation, 1990)



region's 1989 hardware shipments for two reasons. First, Yugoslavia was not subject to the same export-control restrictions on importations of computers as the other EE countries. An import substitution policy kept the price of Western equipment artificially high and, most likely, kept demand down.

The Role of the CMEA

Second, Yugoslavia was not a full fledged member of the Council for Mutual Economic Assistance (CMEA). The CMEA, established in 1949 by the Soviet Union and other East Bloc countries in response to the Marshall Plan, was designed to unite and coordinate member countries' economic integration, and to achieve more rapid technological progress. Promoting economic integration within the CMEA also carried over into the joint development and trade of computing technology.

Joint development programs benefitted the USSR since the computer industries of the GDR, Hungary, Poland and Czechoslovakia were generally more sophisticated than the USSR. In addition, CMEA countries benefitted from the economies of scale associated with direct access to the much larger Soviet market.

The CMEA still has relevance to understanding current market dynamics. For example, Yugoslavia absorbed far less CMEA-produced hardware, relative to other EE countries. It now has far fewer systems — in comparison — which must be, literally, scrapped. The concept of "upgrade" has almost no significance in present day Eastern Europe.

Country-by-Country Growth

Countries of Eastern Europe fall into a three-tiered growth pattern from 1989 to

1994. East Germany will grow at approximately 34%, compounded annually, followed by Hungary, Poland, and Czechoslovakia at 20-22%. Yugoslavia will grow at rates much closer to the more saturated Western European markets, approximately 10%.

This forecast is based on spending across IDC size-class definitions, which obscures expected variations within size classes. It hides the fact that the markets are growing from significantly different levels of computer technology usage. It also shows the aggressiveness with which the incorporation of Eastern into Western Germany will proceed.

From the begining of 1989, and during the early years of what we have called the "critical 1989-1991 period of reform," a virtual cascading into the lower size classes from above will occur. This is partly due to classification methods as well as the age of CMEA processors, many of which can be replaced by smaller Western-made systems. It is particularly noticeable in the medium-scale segment where, in all countries except Yugoslavaia, the installed base will contract until 1992 or 1993.

Czechoslovakia: Strong on Fundamentals

The Czechoslovakian computer industry has focused on small-scale and very low-end medium-scale systems. Until 1989, severe import restrictions forced Czechs to make do with what they had: 8-bit proprietary CMEA small-scale systems. Most PCs in use entered the market over the last two years. Local area networks are virtually nonexistent.

Czechoslovakia was responsible for developing medium-scale systems under the CMEA's joint computing program. Many were installed and most of them remain — ripe for replacement by small-scale systems and PCs. The CMEA producers of multiusers systems inside and outside the country are vacating the market, leaving a window of opportunity for Western producers.

The general outlook for Czechoslovakia is strong. The country's economy appears to be in a relatively better position to implement and weather necessary changes.

Poland: Weathering the Storm

Since 1985, Poland has been the most open PC market in Eastern Europe. Approximatley 90% of imported PCs come from the Far East. Poland is still a significant exporter of PCs to the Soviet Union.

In general, information technology skills are lower than elsewhere in Eastern Europe. IDC is relatively less bullish on Poland than other countries in the study. Demand for sophisticated computers will remain high, but the weight of unfavorable short-term economics makes anything but a cautious strategy suspect.

However, the speed and depth of economic restructuring have encouraged vendors such as ICL to remain in Poland, and have prompted relative newcomers like Unisys

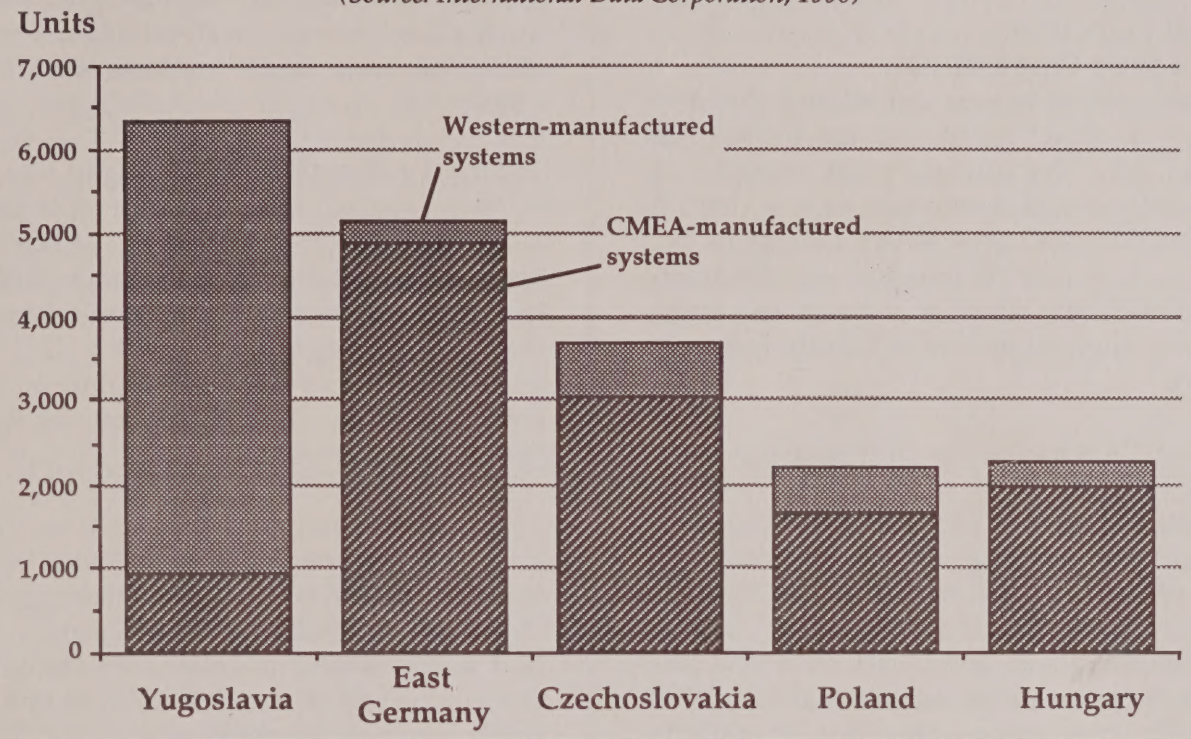
(continued on p. 6)

Everything You Ever Wanted to Know About Eastern European IT Markets

Information in this issue of the *Computer Industry Report* has been excerpted from a recent IDC examination of Eastern Europe computer markets. The research was conducted from IDC's newest offices, in Berlin, Budapest and Warsaw. The 350-page "Eastern European Computer Markets" multiclient report provides complete market share data for each country, five-year market segment and subsegment forecasts, installed base data, and complete historical background information. Interested parties contact IDC's Paul Pastrone, at (508) 935-4528. In addition, IDC's study of CAD/CAE/CAM usage in Eastern Europe will commence in January for completion in May 1991. Contact Gisela Wilson at (508) 935-4234 for details.

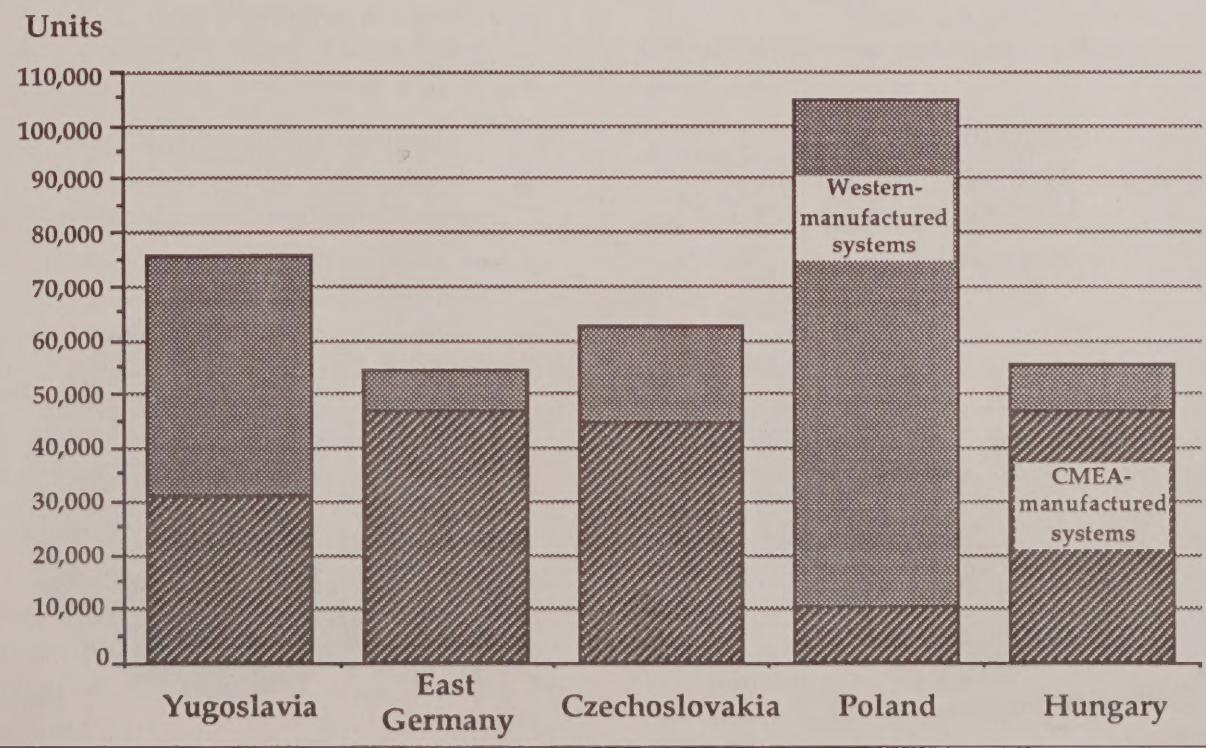
CMEA- and Western-Manufactured Multi-User System Installed Base, 1989

(Source: International Data Corporation, 1990)



CMEA and Western PCs and Workstations Installed Base

(Source: International Data Corporation, 1990)



and IBM to expand their small operations there.

East Germany: Insider's Opportunity

East Germany was considered the most coomputerized country of the former East Bloc. East German computer markets are more fluid and dynamic than any other in the region. IDC expects that shipments into the eastern half of Germany will quadruple by 1994, accounting for as many computers as was shipped into all of Eastern Europe in 1989.

East Germany is the only country where IDC expects that high growth will cut across all system size classes. Close to 75 large-scale systems will be installed there by 1994.

East Germany attempted over the past decade to create an educational infrastructure for computing technology. In addition, Robotron, the East's largest and most comprehensive computer supplier, established a half-dozen training centers which processed close to 30,000 workers annually.

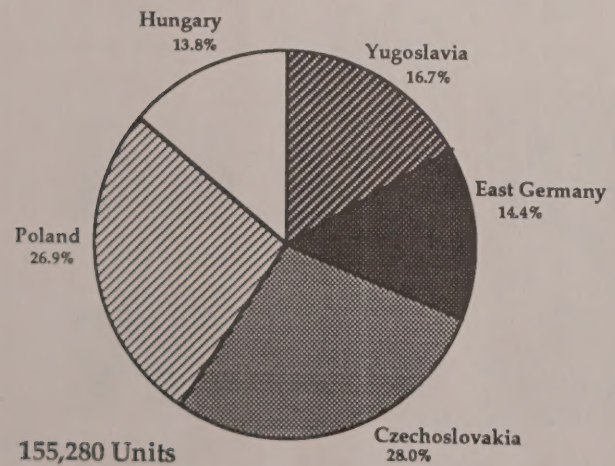
Despite the enormous potential for the sale of computer hardware as part of the reunification process, IDC sees the Eastern region of Germany retaining its reputation as an insiders' market: well-established vendors will have better opportunities than newcomers.

Hungary: Small and Steady

The Hungarian computer market is small and regional. It conisists largely of PCs and small-scale systems: approximately 80% of the $53 million 1989 computer hardware market was single-user systems. IDC expects that PC growth will continue to outstrip growth in all other market segments for the next five years.

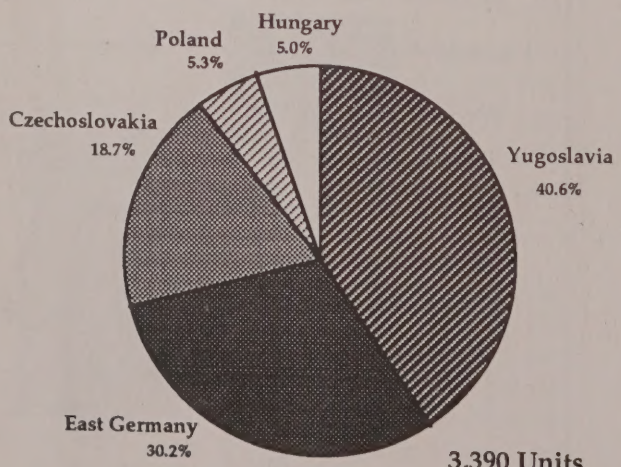
Inherent in Hungary's halting twenty year transition to a market economy was the decentralization of planning and management uncharacteristic of other CMEA states. Limited forms of private enterprises facilitated the emergence of a small number of relatively advanced assembly operations. These producers appear to be holding their own, in the face of encroachment of brand names from the West, although increasing numbers are staking their future on cooperation with Western partners.

Eastern Europe PC and Workstation Unit Shipments, 1989
(Source: International Data Corporation, 1990)



155,280 Units Shipped

Eastern Europe Multiuser System Unit Shipments, 1989
(Source: International Data Corporation, 1990)



3,390 Units Shipped

Yugoslavia: Closer to Europe, Farther From Home

The Yugloslavian computer market is distinct from other EE markets. Because Yugoslavia was neither a member of the Warsaw Pact nor CMEA, its exposure to developments in Western computer technology was greater than elsewhere in Eastern Europe.

Western vendors dominated the 1989 multiuser segment, accounting for almost 90% of shipments. Unisys and Olivetti were multi-user segment share-leaders, followed by Bull and Kienzle. Yugoslavia's most important multiuser vendor, Iskra-Delta, recently announced bankruptcy.

Most Yugoslavian manufacturers are now focusing their efforts on manufacturing PCs. But import liberalization is likely to force out the remaining local manufacturers, which for the most part are unable to compete in an open market without government protection.

The Newest Raider: Mike Milken's in Jail, But Ma Bell's on the Loose

How quickly things change. About the time we last went to print, AT&T announced it was embarking on a hostile takeover bid for NCR's shares. After friendly (from AT&T's standpoint, anyway) discussions for the oft-rumored merger failed, a war of words erupted.

"How can you maintain that a merger at $125 per share would be a good deal, but a merger at $80 would be a disaster?"
— AT&T's Robert Allen

"We've got to remember that a sick elephant can kill a healthy dog just by falling on it."
— NCR's Charles Exley

Future IDC research is dedicated to the larger, more fundamental, aspects of the action. Herewith is a brief rundown on some immediate challenges, should AT&T prevail.

Key Challenges

•NCR and AT&T are both trying to beat industry growth rates by launching networked computers into new markets, requiring **major** sales, marketing and technology transitions. That's difficult enough. A messy takeover will only make things worse.

•NCR has only just begun the process of moving customers running NCR POS terminals from backroom proprietary systems to Unix-based computers. AT&T is buying instant — but not fool-proof — credibility.

•Blending comparatively smooth product lines might be hard. While both companies make Unix V.4-based, Intel multiprocessing, networked small systems using LM/X and HP's NewWave, NCR uses Motif and AT&T OpenLook.

•NCR's superb financial management may be lost in the merger if mass defections result.

Competitive Implications

Should the merger go through, speed is of the essence. AT&T's and NCR's customers will need to know, immediately, of future product directions.

Any delay in the two companies' product transitions could be disastrous, given HP's rapid growth in Unix minis and the potential of IBM, DEC and Sun. Neither has had much success selling into corporate MIS, nor at selling next-generation development platforms. Both have to convince MIS that networked servers can support and/or supplant mainframe applications. Any confusion in sales messages to that skeptical crowd will be harmful, if not deadly.

Digital's stock rose 4% on the news that the company is considering its first ever forced layoffs. Until now, Digital has been shedding staff under euphemisms like voluntary reduction, natural wastage and corporate downsizing. As many as 3,000 workers may be laid off, though a spokesperson admitted that job cuts will have to be managed carefully to avoid killing the goose that laid the (now somewhat tarnished) golden egg.

Ashton-Tate's dBase products lost copyright protection when Federal courts determined that dBase had murky ties to public domain software. A chief creator of the original dBase admitted using a language developed at NASA's Jet Propulsion Labs. The presiding judge, Hon. Terry J. Hatter, dismissed the case, finding that Tate "knowingly" misled the U.S. Copyright Office by refusing to acknowledge dBase's shareware roots. Tate CEO Mr. William Lyons said "We haven't been able to articulate why he is in error. We will do that next week."

Sandra Kurtzig has hit the road to sing Ingres' praise: "Great technology, but lousy marketing." Sound familiar? It should: the "lousy marketing" line's de rigeur in such takeovers. Kurtzig was quick to call EDS a partner, but snubbed HP in favor of Price Waterhouse. Of the lot, she claimed it's "like dating three men at once." ASK will definitely emphasize Ingres' graphical 4GL, and will try to use Ingres to get ASK beyond its base in manufacturing. Plus, while ASK only does 18% of its business outside of the U.S., Ingres does over 50%.

Two Silicon Valley heavyweights, Mike Markkula (Apple) and Ken Oshman (Rolm) are back at it. Their Echelon Corporation markets intelligent sensors and controllers in networks for applications like environmental or manufacturing monitoring and management. It's building the building blocks of intelligent buildings. And smart machinery. Motorola and Toshiba will manufacture the "Neuron" chips. The networks will be sold through construction companies, contractors and equipment vendors.

Superserver maker NetFrame announced a $26K '486 product and said that its boxes could now run un-customized Netware. That should answer critics (most of whom reside in Houston) who claimed that NetFrame was too "proprietary." Still, if superservers are killing the minicomputer market they aren't coming from these guys. NetFrame figures to ship 500 units (into the dealer channel — a couple hundred to end users) by yearend, and Compaq might move 12,000 Systempros.

Edson de Castro, 22 years after jumping from DEC, is no longer a Data General employee. The DG board voted him out as it continues to flounder — total workforce is now nearly one half of its 1985 level. Ronald Skates had taken more and more of de Castro's responsibilities so that little tangible impact is expected to result.

A hum-bug in the software? Rightwriter, a grammar checking program from Que Corporation (a Macmillan Publishing unit), has determined that Charles Dickens' classic "A Christmas Carol" could use some tightening. Lengthy sentences, excessive use of the passive voice and inaccurate punctuation, it seems, indicate that Dickens' writing is targeted toward readers at today's fifth grade level. The program offered 118 suggestions to "improve" Dickens' writing. Unfortunately Rightwriter was unable to catch a typo in the press release where "advise" was used when "advice" was needed. A Que spokesperson attributed the gaffe to "human error." Dickens himself would surely just say "humbug;" the *Gray Sheet* adds "God bless them, every one."

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1990 Systems Results: Midrange Flat, Workstations and Unix Systems Boom; Other Segments Up Slightly;

The Midrange in 1990: Is this the Shape of Things to Come?

Despite notable bright spots, overall growth in the 1990 midrange systems market slowed even more than IDC's originally pessimistic forecasts. Unless servers kick in stronger than looks likely, the outlook for 1991 is for more of the same.

Major product overhauls in 1990 could position a handful of U.S. companies — IBM, Hewlett-Packard, NCR, Sun Microsystems, Cray — to do well in 1991, but most other suppliers continue to be squeezed between the desktop and data center. DEC and Tandem will slowly move upscale into large systems. Many companies trying to reposition minis as servers and "open systems" will face the brutal price competition forced by Unix hardware. Some 1990 midrange highlights:

- **The U.S. market** continues to be the first to plunge, while the U.K. is leading the European slowdown; Japan remains relatively strong

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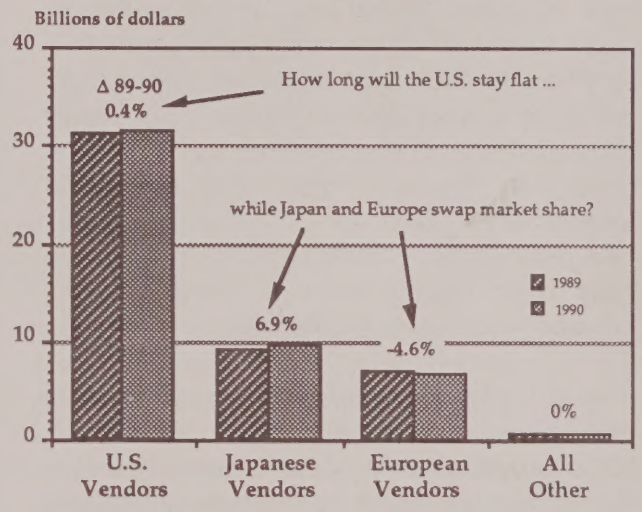
1990 Worldwide Midrange Market
(Source: International Data Corporation, 1991)



- **Midrange mergers.** The first of what will probably be a series of midrange mergers often emphasized globalized markets: Fujitsu/ICL, Siemens/Nixdorf, Bull/Zenith Data Systems, DEC/Mannesmann Kienzle, and AT&T(?)NCR

- **Unit shipments** continued to shrivel while, for some, average system values crept up as users bought fewer, but loaded systems

- **Dramatic Unix growth continued,** but it forced heavy discounting — even for non-Unix hardware — and lousy margins; it also encouraged companies to position previously proprietary systems as

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"open" via exposing programming interfaces and pledging Posix compliance

- **Two that didn't happen:** "upsizing" and server supremacy

The midrange market continued to show an even more global face, as U.S. orders continued to stretch out and taper off. U.S. suppliers consistently saw most of their sales outside their domestic market, though few capitalized on the strong Japanese market as well as the indigenous suppliers did. Strengthening European currencies continued to make U.S.-manufactured products look cheaper, but a looming recession in most European countries make them less safe havens they once were. A unified Germany, as well as Italy, appear to be stronger through 1991. The yen weakened versus the dollar, so Japanese companies' financials look relatively stronger than their comparative performance. Still, Japanese companies rode their strong national climate to increased worldwide market shares.

Most Japanes vsndors have much weaker presences elsewhere, and Fujitsu and Mitsubishi took acquisitive steps to remedy that -- Fujitsu buying longtime technology customer ICL (and unsuccessfully bidding against DEC for Mannesmann's computer operations) and Mitsubishi outbidding Intel for Apricot's British manufacturing facilities. European national suppliers, relatively weaker across Europe than U.S. multinationals, probably will continue to seek U.S. and Far Eastern partners, or double up a la Siemens/Nixdorf.

A global trend that continued from 1989 was a dramatic slowdown in traditional midrange unit shipments. This time, however, few companies were able to escape upward with pricy enough systems to fatten margins -- 1990 was a year of big losses for many. While DEC experienced a nearly month-by-month increase in ASVs for its VAX 4000 and 6000 models, the increase was not enough to offset sagging shipments.

A ray of hope came from the Unix small systems market. Battered a couple of years ago by Unix PCs configured as multiuser systems, Unix small systems vendors rebounded strongly -- particularly with RISC workstation-server architecture systems like IBM's RS/6000 and Sun's Sparcservers. Unix midrange suppliers did extremely well overall, as Unix systems showed high double-digit growth.

The open systems marketing message was not a Unix-only one. IBM pledged to open up the S/3x's programming interfaces to encourage third-party software, DEC and HP said their operating systems would support Posix interfaces, and Unisys said it would meld its entire product line via X/Open interfaces. While IDC suspects that few powerful applications will be written to the function-weak Posix, the trend for an ever-wider and richer set of standardized programming interfaces and communications protocols will encourage software portability and, more importantly, interoperability in the mid-90s.

Finally, two strategies to flee the midrange squeeze did not pan out in 1990: both the high and low roads proved tricky navigating. Various technical delays impeded Digital's 9000 assault on mainframes while Tandem had a tough time figuring out how to sell Cyclones in that space. Both had by far the most success selling into their own cus-

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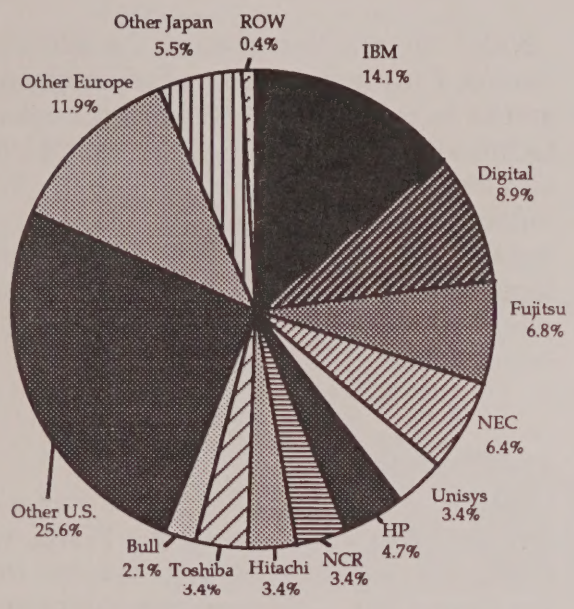
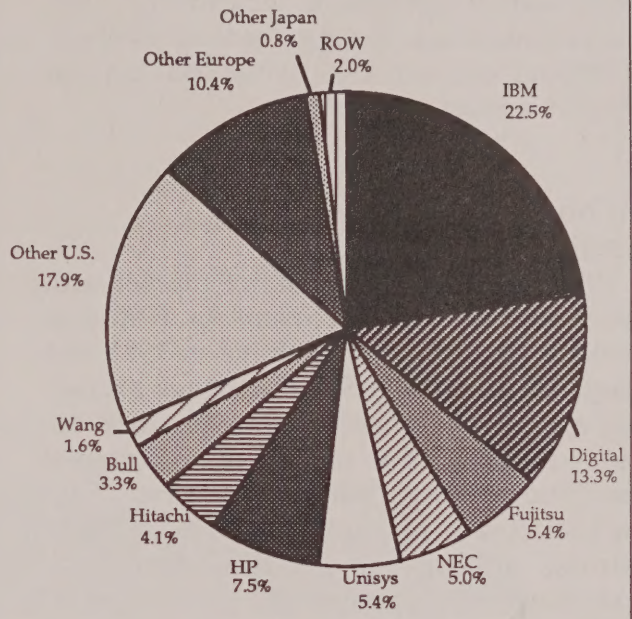
Small- and Medium-scale Market Leaders

(Source: International Data Corporation, 1991)



Total small-scale: $23.6 billion



Total medium-scale: $24.9 billion

tomer bases. Tandem had a pretty good year overall, while the incremental $400 million worth of 9000s DEC sold were not enough to the ease the pain inflicted on its bottom line by continued downsizing.

And a much-ballyhooed low-end market failed to appear -- PC- architecture based systems didn't have enough software support, and few minicomputer vendors had much success selling into PC LAN environments. Compaq's Systempro (about $200 million — 60% Unix rather than Novell Netware) did not meet wild Wall Street expectations, but then again it didn't wipe out the traditional minicomputer market either. At least not yet.

Market Growth

The chart on these pages detail IDC's preliminary estimates of the two midrange market segments (small systems under $100K and medium systems under $1 million). The midrange market underperformed our expectations, though currency fluctuations dampen or dramatize global markets in any given year. Still, the trend of flat to negative growth in the U.S. and flattish growth elsewhere reflects the solidifying barrier into large-scale systems that the IBM plug-compatible market provides, as well as the continuing PC onslaught on IS budgets.

There was little in the way of market share shuffling in 1990, although IBM showed dramatic growth with small-scale AS/400s and RS/6000s. Hewlett-Packard also improved its lot, as did the Japanese suppliers.

The outlook for the first half of 1991, given recessions and war, is a grim one for most segments. The once-blooming fault-tolerant segment of the midrange looks sluggish and threatened by DEC, and traditional mini architectures offering high availability features. Unix remains a strong growth area for top if not bottom lines. Overall, we believe the U.S. medium-scale market will continue to contract in 1991, and international markets won't be much better. Small-scale LAN

servers won't be enough to push U.S. growth, although the Japanese small systems market continues to look strong. Telecommunications buying held up through 1990 and will into 1991, while banking and finance appear weaker.

Who Did What in the 1990 midrange:

IBM shook up the midrange market with two product announcements in 1990 that will be extremely competitive in 1991 and beyond. The RISC RS/6000, though primarily aimed at technical workstation markets, added nearly $400 million of incremental revenue to IBM's small-scale business. It did not affect sales of AS/400s, which continued strong, although as the RISC family expands, it will pressure IBM's commercial midrange more. The airframe ES/9000s will be extremely attractive to IBM customers (many of whom are "upgrading" down from larger systems) and may do to the midrange what the 9370 never could: spread the 370 environment further into the organization.

Hewlett-Packard overhauled its entire midrange product line, and has successfully made the transition to highly upgradeable RISC systems. HP's economy of scales strategy (similar hardware architecture, different operating systems) is paying off: its MPE business outperformed the market, and its Unix midrange offerings grew over 50%.

NCR made what it called its biggest product introduction ever -- a scaleable series of systems based on multiple Intel microprocessors and running Unix up and down the line and DOS, OS/2 and Netware at the low end. The line will be topped in 1991-1992 by Teradata loosely-coupled parallel processing technology that NCR hopes to take against mainframes. NCR's strategy looks extremely flexible and software-compatible, but the specter of an AT&T takeover could seriously slow its execution.

Both Cray and Sun entered the midrange market. Cray announced its first minisuper, and looks to be a serious threat to Convex in technical markets in the second half of 1991. Sun blew into the market with nearly $500 million in server sales. Sun faces tougher going as it tries to leverage its networked desktops into more commercial applications while watching IBM over its shoulder in its home market.

Conclusions

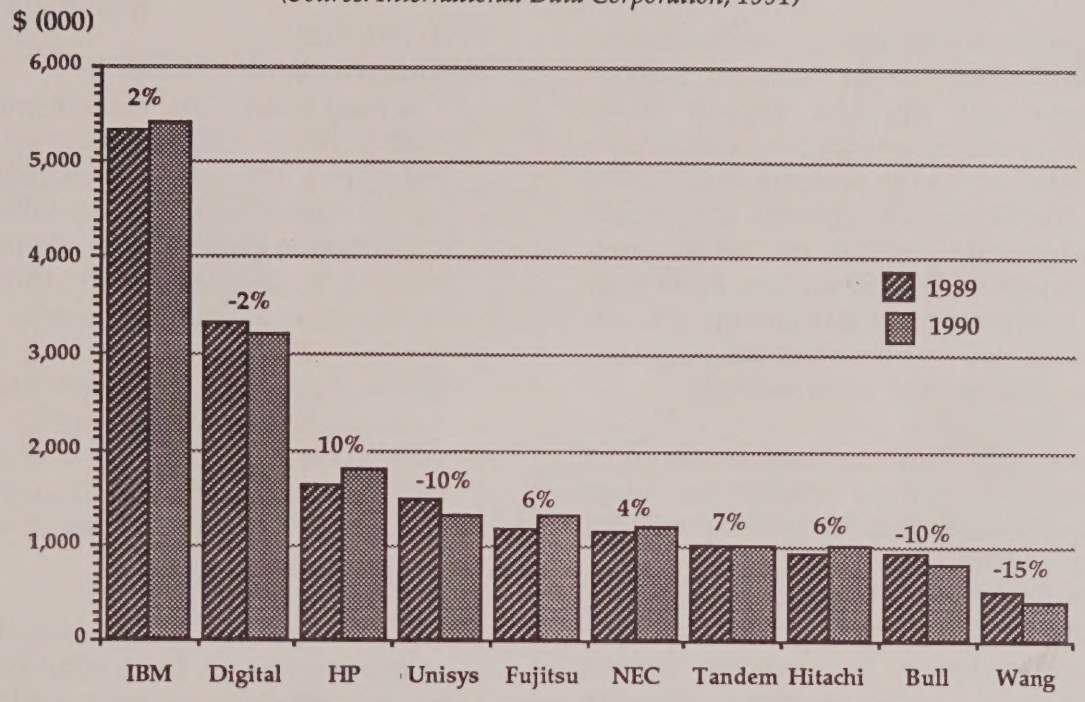
We believe IBM's ES/9000 mainframe offerings, as well as those of the PCMs, will continue to wall out midrange systems from the data center. IBM may even continue to migrate down into the midrange. While Unix database engines from Sequent and Pyramid continued to experience strong sales, by the end of 1990 HP and DEC were forcing price competition.

Traditional small-scale systems vendors will continue to struggle, as new entrants (Sun, Compaq, the RS/6000, superservers, etc.) take up much of what growth there is. A recent IDC survey shows that PC LAN servers will continue to be Novell boxes in the minds of users for the near future. We estimate that mini makers have a 1-2 year window to try and sell low-end LAN servers through VARs and direct sales, and educate a largely ignorant LAN user base on the strengths of centralized data and systems management. By then, the PC channel will have figured out how to sell complex systems, or systems integrators and VARs will have moved overwhelmingly to hardware using PC-like cost structures and distribution.

— With David Card,

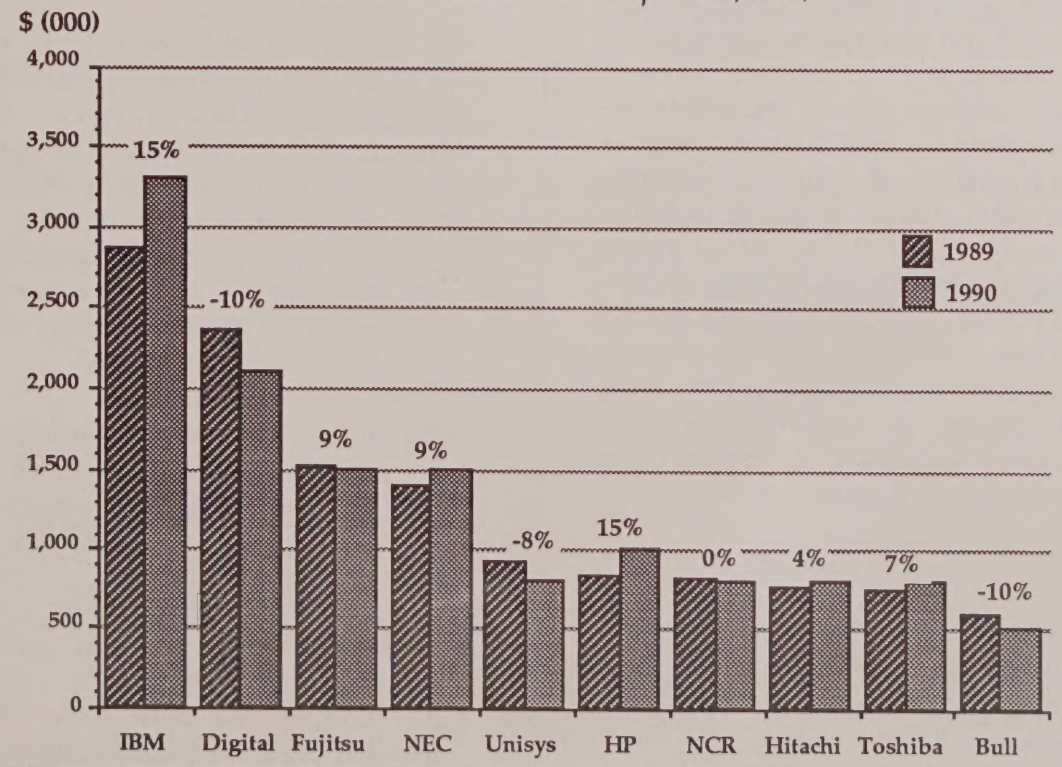
1990 Worldwide Medium-scale Market Share Leaders

(Source: International Data Corporation, 1991)



1990 Worldwide Small-scale Market Share Leaders

(Source: International Data Corporation, 1991)



1990 Worldwide Large-Scale Systems Market Overview

Aging products and user tendencies to purchase fewer, but larger, systems pushed mainframe unit shipment growth down 15% worldwide. However, the trend to purchase more expensive systems, and a very strong DASD market, enabled the worldwide large-scale systems market to grow 3.4% to a total of $30,250 million. From both a unit and a revenue standpoint, IDC research indicates that business was considerably slower in the U.S. than overseas.

Temperate growth has been a feature of the overall mainframe market for some time, but business was not as usual in 1990. Against a backdrop of expectations surrounding IBM's September ES/9000 announcement, site consolidation, and Japanese aggressiveness and success, system pricing came under extreme pressure worldwide. In the United States, discounts for some vendor's products reached over 40%. Additionally, both Digital and Tandem significantly ramped their mainframe efforts, leading to a restructuring of both unit shipment and revenue market shares.

Although revenue growth prospects improve, competition will remain fierce in 1991. IBM may begin shipping its new technology ES/9000 models by the end of June, a quarter early. Additionally, DASD suppliers will begin shipping products to compete with IBM's 3390. Thus, in both the system and DASD markets, the industry is about to embark on new product life cycle curves. However, the new generations of far more powerful large systems will only fuel user desires to consolidate systems.

Furthermore, despite sincere efforts to check discounting, early reports indicate that pricing remains cutthroat. The result will be more dollars spread across fewer footprints — and increased competition to supply those mainframe feet.

1990 Market Highlights and Trends

- **The total mainframe market grew 3.4%** to $30.2 billion. U.S. market grew 1.8% to $9.6 billion. International sales fared better, increasing 5.6% to $20.6 billion. U.S. consumption of the worldwide total contributed its decline in 1990, dropping to 31.7% of the market.

- **IBM's September ES/9000** announcement set the tone for the year. On a quarterly basis, business for the first six months was slow, the third quarter was abysmal, and the fourth quarter was supply constrained.

- **Price competition** dominated the 1990 sales environment. In an effort to compel users to purchase the last round of 3090-class systems, vendors resorted to severe discounting. Users responded by purchasing larger systems while they were cheap, through upgrades.

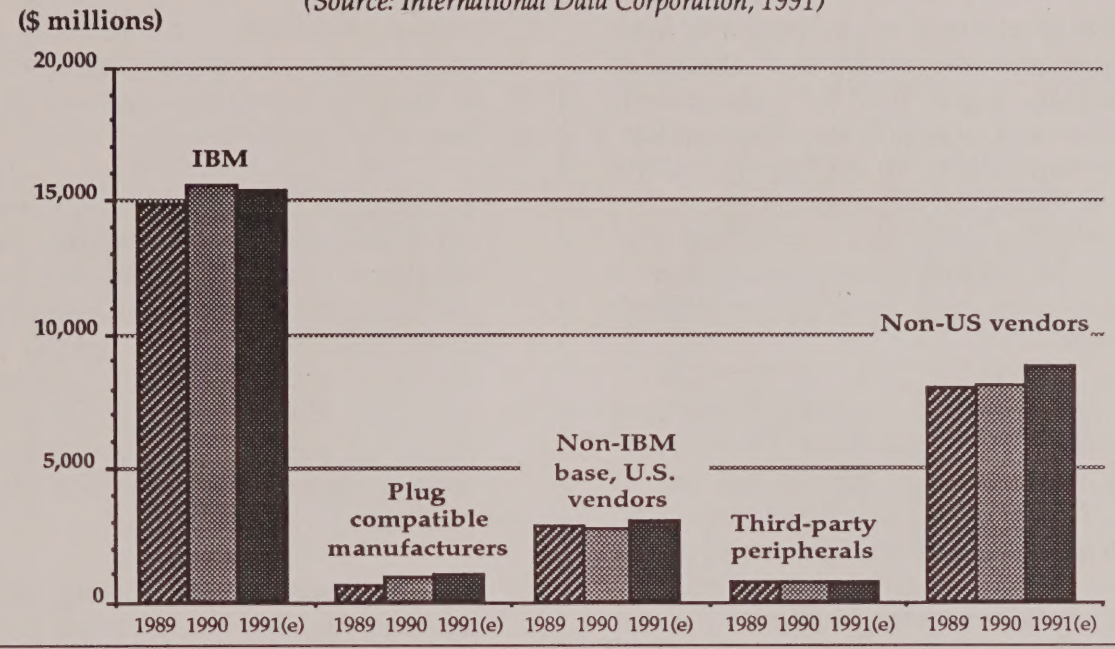
- **In the S/370 and compatible market,** IBM saw its revenue decrease 1.6% to $15,250. Amdahl's shipment revenue grew 2.9% to $1,770 million as significant decreases in unit shipments were largely offset by customer purchasing of the company's top-of-the-line machines. Hitachi Data Systems enjoyed a tremendous resurgence in 1990, growing 16.9% to $760 million.

- **Digital and Tandem** both gained impressive share in their first full years of competing. Digital's VAX 9000 machines contributed $420 million; Tandem's Cyclones added $280 million.

- **Of the old Bunch players,** only Unisys had any cause for celebration. Although the company's mainframe revenue dropped 5.1% to $1,290 million, accep-

Worldwide Mainframe Revenue, 1989-1991(est.)

(Source: International Data Corporation, 1991)



tance of the 2200/600 family continues to be very good worldwide.

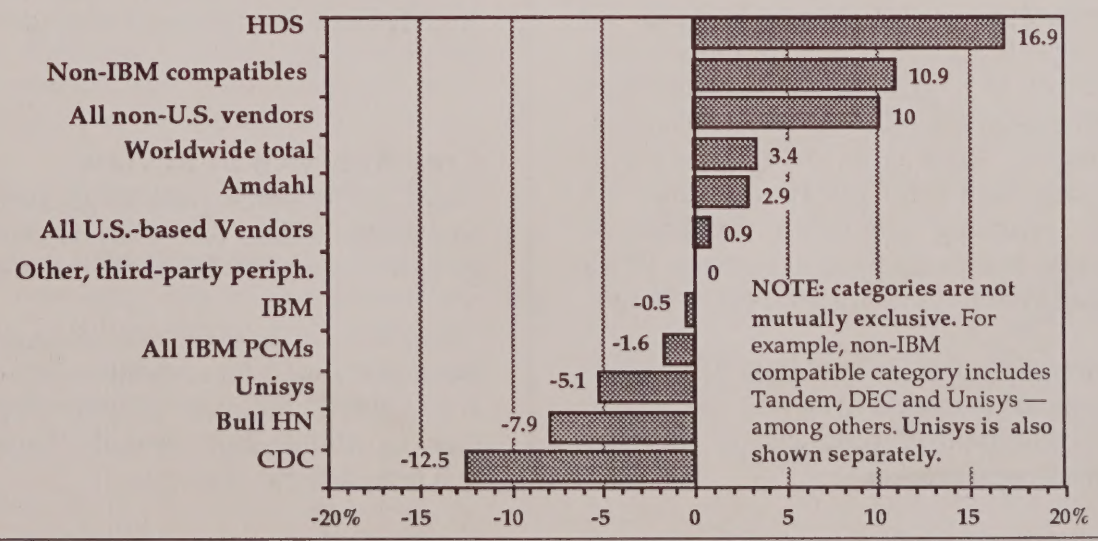
- **DASD** sales were very strong, especially for IBM.

- **Although the standardization** of mainframe software increased, especially in the database and tools arena, IBM continues to dominate the direction of standards. Unix was not, and will not — in the near term — be a force in the general mainframe market.

— With Peter L. Burris,

1989-1990 Worldwide Mainframe Revenue Growth, Selected Categories

(Source: International Data Corporation, 1991)


HDS 16.9
Non-IBM compatibles 10.9
All non-U.S. vendors 10
Worldwide total 3.4
Amdahl 2.9
All U.S.-based Vendors 0.9
Other, third-party periph. 0
IBM -0.5
All IBM PCMs -1.6
Unisys -5.1
Bull HN -7.9
CDC -12.5
NOTE: categories are not mutually exclusive. For example, non-IBM compatible category includes Tandem, DEC and Unisys — among others. Unisys is also shown separately.
-20% -15 -10 -5 0 5 10 15 20%

Supercomputers: Marginal 1990 Growth, Cautious Optimism for 1991

The 1990 worldwide supercomputer market experienced marginal growth of 9.9% in 1990, slightly higher than IDC anticipated. Flat revenues for Cray Research, precipitated by several factors — the impact of alternative technologies, the aggressive marketing of Japanese competitors, slow high-end growth, and the anticipation of several new products — combined to slow overall market growth.

IDC expects double-digit 1991 supercomputer growth, due primarily to Cray's product line expansion, and the first full year of Fujitsu VP-2000 and NEC SX-X shipments. IDC identifies several key growth opportunities — petroleum and energy, fluid dynamics, climate modeling, computation and chemistry — which will fuel market growth.

Several factors had significant impact on supercomputer revenues:

- **Replacement, rather than expansion.** The high-end supercomputer market continues to be primarily a replacement market. While IDC expects significant expansion opportunities between 1991 and 1993, there was very little expansion in 1990.

- **Technology substitution.** Budgets for high-performance supercomputers, particularly at large sites, are undergoing a shift due to the influx of alternative technologies. While large sites are still purchasing high-end Cray systems, they are also pursuing alternative technologies such as massively parallel systems, RISC-based systems, and minisupercomputers.

- **Supercomputer downsizing.** The supercomputer market is driven by the need to offer competitive products for the non-government market.

- **Buyer trepidation.** The visibility of future products, which will be announced in the next 24 months, continues to delay large systems purchases.

- **Political pressure.** Politics continues to drive U.S.-Japan trade relations, particularly with respect to supercomputer procurements. For U.S. supercomputer vendors, penetration of the Japanes public sector market remains difficult, despite limited headway in 1990. Japanese supercomputer vendors are pursuing multifaceted strategies to penetrate the U.S. market.

- **Lower government spending.** Slowing demand has been exacerbated by shifts and cuts in federal spending, as well as cuts in defense spending.

1990 Market Results

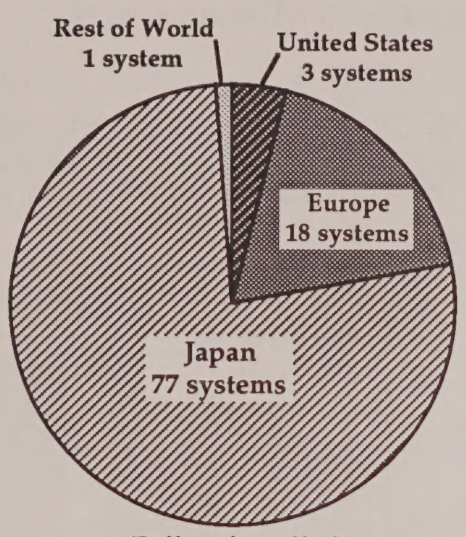
The worldwide supercomputer market reached $956 million in 1990. Cray Research was the undisputed worldwide market leader with revenues of $804 million on shipments of 64 systems. Three Japanese vendors followed Cray. Fujitsi shipped approximately 22 systems, a 144% increase over 1989. NEC shipped five units, only one of which was the newly introduced SX-3. And Hitachi also shipped five units, all to Japan.

Cray Research in Review

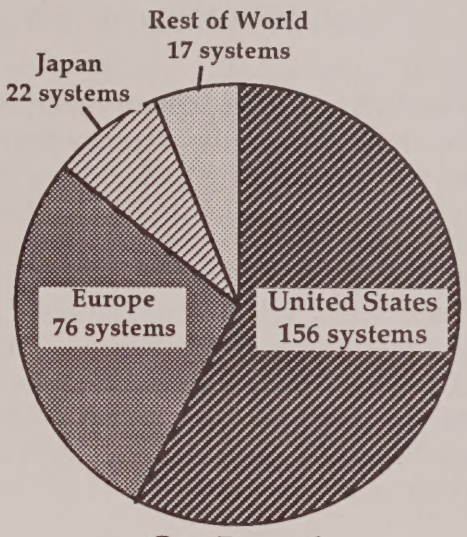
As Cray Research goes, so goes the supercomputer market. And Cray is expected to go to the tune of 10% growth into 1991.

Cray's entry into the minisupercomputer market, through its acquisition of Supertek, is a critical component of its strategy to return to double-digit growth. However, it still faces several obstacles:

Cray, Fujitsu Supercomputer Installed Bases, 1990
(Source: International Data Corporation, 1991)



Fujitsu installed base: 100



Cray Research installed base: 271

- **Multiple product introductions/ transitions.** In addition to the two expected product announcements — the YMS second-generation minisupercomputer and the YMP-16 — IDC believes Cray will unveil a second-generation 2E product as well as a mid-life kicker at the high end of its current product line.

- **Change in product mix.** Cray's foray into the low end of the high-performance market, and the launching of the Entry Level Systems Division, formerly Superte, mark a significant departure from Cray's traditional business.

- **Earnings pressure.** Additional marketing-related expenses resulting from a dedicated sales force for the ELS Division, a potential rise in R&D-related expenses above the stated 15% of sales target, and longer sales cycles are combining to further lower margins.

Long Term: Product Line Overhauls

IDC expects that high-performance vendors' product lines will evolve dramatically in the 1992-1994 time frame. Our expectations include:

- **Massively parallel systems.** Cray Research, Convex Computer, IBM, Japanese vendors and even Digital will debut massively parallel systems between 1992 and 1994.

- **RISC minisupers?** The midrange of the supercomputer market will continue to be a critical growth area for traditional supercomputer vendors. IDC expects it will be among the most contentious of supercomputer markets in 1991.

In addition, IDC expects U.S. supercomputer vendors will begin to get serious about shared R&D in 1991. Their support for a high-performance technology infrastructure — similar to the Japanese keiretsu — is well known.

— With Debra Goldfarb,

1990 Worldwide Winchester Market: 30% Unit Growth is Driven by Notebook, and Low-end PC Demand; Total Worldwide Shipments Surpass 26 Million Units

The central Winchester industry themes — time to market, extreme supply/demand tension, and plummeting price/MB — once again dominated 1990 hard-disk drive markets.

The 1990 OEM Winchester industry was wrought by undersupply for much of 1990. All 3.5" — below 300MB — segments experienced significant growth throughout the year whereas 5.25" growth was evident only at the high end.

- **Worldwide shipments of all small Winchester drives (2.5", 3.5", and 5.25") totalled 26.6 million units.**

- **Sales of all 3.5" drives grew 58% and totalled over 20 million units.** IDC believes the increase was primarily due to two factors: growth of specific market segments, and dropping prices. The high growth of 1" 40MB drives, as well as drives with capacity between 80 and 200 pushed overall 3.5" growth. Average prices for 3.5" drives dropped well below $300, making them the drive of choice in low-end PCs.

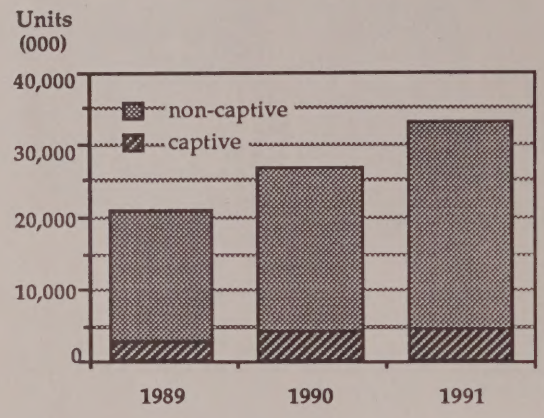
- **5.25" growth was confined to high-capacity segments.** Sales of 380MB drives grew modestly while 760MB and 1GB drives grew more rapidly.

- **Shipments of 2.5" drives reached 600,000 on the strength of steep ramps by Conner and PrairieTek.** Although prices remain high, 2.5" drives are the clear winner for notebook applications.

Too Much Demand For Supply

Growth of mobile PCs — to 10% of the total worldwide PC market — as well as fanless desktops spawned demand for smaller, cheaper, high-performance drives. No segment was affected more than the 1" high, 3.5" 40MB market. Quantum, Conner and IBM supplied the majority of of these products, but the lack of volume production and unreliable component availability kept other companies from shipping at full production levels for most of the year. Seagate and Maxtor began shipping into the segment late in the fourth quarter.

Worldwide Winchester Market, All Sizes and Capacities, 1989-1991(est.)
(Source: International Data Corporation, 1990)



Or, Vice Versa

The potential for industry overcapacity (*GS* 26:3-4) in the fourth quarter (created by new generations of higher-performance 3.5" drives) led to huge price cuts late in the year. The price cuts spurred demand and, as a result the potential overcapacity never materialized.

— With Crawford Del Prete, Alexa McCloughan

Slower but Still Searing: Workstation Growth Continues; Sun and IBM Win Big; DEC, HP Lose Share

Even though workstation growth slowed somewhat during 1990 to 20% in revenues and 34% in shipments, workstations remained the industry's hottest growth market.

Workstation vendors worldwide shipped 376,000 systems during 1990, deriving $7.3 billion in equipment revenues.

Sun's huge volumes enabled the Sparc processor to gain share, largely at the expense of MIPS and Clipper. Sparc increased from 55% of all RISC workstations/workstation servers in 1989 to 66% in 1990. Both MIPS and Clipper lost share between 1989-1990. IBM's RS/6000 represented nearly 8% of all 1990 RISC shipments.

Softness in the U.S. market, pricing pressure, and product and chip delays contributed to the slowdown in growth from 1989. Among the notable 1990 workstation events:

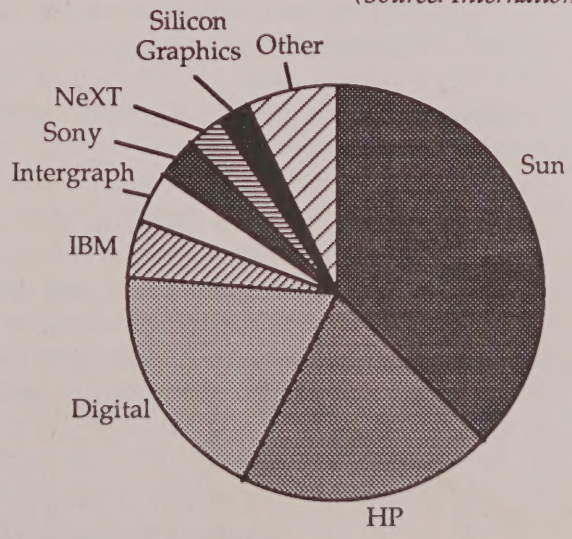
- **Nothing like IBM to shake things up.** IBM successfully reentered the workstation market with an aggressive product line that dramatically altered the competitive environment. While Sun's strategy was to beat specific price points, IBM focused on raw price/performance — a clever tactic considering IBM's lack of a less-than-$10,000 box. IBM's ploy in effect made Sun, Digital and HP vulnerable in the $20-40,000 range where IBM boasted higher performance due to its superscalar architecture.

- **Chip delays hurt.** Several vendors were hurt by chip delays: HP by Motorola's 68040 problems; and Digital, Silicon Graphics and Sony by MIPS's R4000. Further, ongoing concern about binary compatibility acros all MIPS's RX000-based products slowed its market acceptance and contributed to MIPS's declining share of the RISC workstation market.

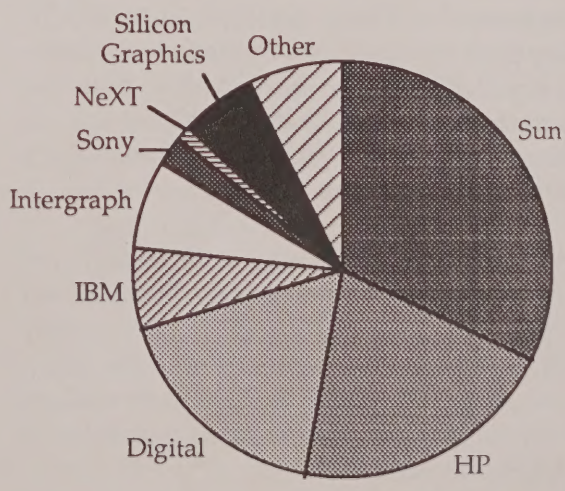
- **The going gets tough.** Brutally short product life cycles and the stiff competi-

1990 Worldwide Workstation Market

(Source: International Data Corporation, 1991)



376,000 units



$7.3 billion

station suppliers out of the business. Tektronix announced its exit in October 1990. Intel entered and exited in a matter of months.

- **Commercial workstations, really.** Sun's success on Wall Street and in banks is well known. But other vendors — including DG, MIPS, NeXT and Solbourne — sold a substantial number of systems for commercial applications.

- **RISC's inroads.** RISC architectures evolved beyond workstations to challenge server, database engine, and even multiuser system products. Sun's Sparcserver 490, for example, is sold as an Oracle database engine, while a large percentage of DG's and MIPS's high-end business is for database and other commercial applications. As price points slide, companies are turning to server sales to salvage declining margins. IDC estimates that servers such as the Sparcserver 470 and 490 comprised 10% of Sun's 1990 shipments.

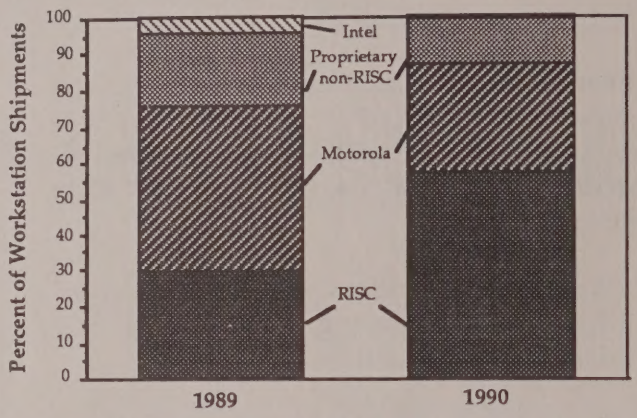
- **Sparc clones.** An infrastructure evolved to support the emerging Sparc clone market, setting the stage for a modest impact on 1991 industry revenues.

- **Motif vs. Open Look.** Sun's stubborn attachment to Open Look in light of ISV support for Motif has made Sun the company ISVs love to hate. Many ISVs are simply porting their applications to third-party Motif implementations which run on top of Open Look.

- **Applications everywhere.** Although the availability of thousands of Sparc-based applications contributed to Sun's early 1990 growth and momentum, it became a nonissue by yearend. All major vendors increased their applications portfolio to 1,500 and beyond.

Workstations by Microprocessor Type

(Source: International Data Corporation, 1991)



IDC expects 1991 to be characterized by stiff competition and pricing pressure at both the desktop and server levels. Desktop workstation pricing will heat up considerably. Among the year's more notable announcements and highlights:

- **Hewlett-Packard** will introduce its first desktop RISC family in March or April. IDC expects they will be positioned as industry-leading price/performers, beginning with a 50MIPS, 8MFLOPS, $12-13,000 desktop. IDC doesn't expect HP to offer a less-than $10,000 entry price point until late 1991 or early 1992.

- **Digital Equipment** will revamp the low-end DECstation line.

- **IBM** will debut a $6,000-7,000 RS/6000 in June or July.

- **Sparcloners** will have their first measurable impact on workstation competition in 1991. Prices will put increasing pressure on major workstation vendors — particularly Sun — to differentiate their products on more than just price/performance.

— With Vicki J. Brown, VP Technical Computing, CAD

American Telephone and Cash Register? Transforming Purchased Technology, Channels, and Employees into Long Term Assets Is AT&T's Biggest NCR Challenge

What do you get when you buy a company? Physical assets (like buildings, product lines, inventory, and receivables) intangible assets (goodwill, marketplace reputation, market relationships and employee expertise), and customers.

What will AT&T get if it is successful in its takeover of NCR? A strategically similar, if competitive, computer line in the middle of transition; a complementary bunch of ATMs; proven distribution channels, software expertise and a computer business perceived, rightly, as thriving and successful.

What does NCR get from AT&T? Some Unix talent, a few big contracts (including hospitality industry business), ties to the systems integration world, plus the boneheaded notion that telephone salesmen can sell networks of computers.

What's the point? In a word, endurance. On the surface, the proposed folding of NCR into AT&T's computer operations (or, vice versa ...) looks good. Both rely on Intel multiprocessor-based systems running Unix to provide solutions to commercial accounts. Both are strong, fiscally conservative companies. The customer bases are both geographically and vertically complementary.

But, to oversimplify, mergers in the computer industry don't work. Almost every one has been characterized by long, painful periods of merging disparate products and technologies (HP/Apollo, and Sperry/Burroughs, for example). The merger of technologies has never proceeded as smoothly as hoped.

That's not the problem here. AT&T's and NCR's simultaneous transitions to Intel-based microprocessor systems may render the incompatible-hardware argument moot. While managing one transition is difficult, and it could be argued that two is doubly so, it's not as bad as managing product lines that are travelling in different directions. So, product-line conflict may not be as big a problem as in past mergers.

But even if AT&T does get over that barrier, (and many have not been able to ...) prospects are still not all rosy. Who says NCR will continue its momentum after the acquisition? Consider a few crucial areas:

- **Hardware:** AT&T is not buying just a hardware business. True, NCR sells billions of dollars worth of POS and automatic-teller terminals. True, it has already had some success moving the back ends of those systems to Unix-based systems. That fact alone may make it notable among old-line minicomputer companies. But hardware technology won't keep customers locked into AT&T/NCR. AT&T adds the mass of a successful retail and banking equipment manufacturer, but little else. This is the age of openness, of end-user empowerment. And that will mean the ability to switch (ie. multiple-source) hardware vendors with relative ease.

- **Distribution systems:** Approximately 30% of NCR's Unix hardware goes through a third party channel. And the loyalty of open-systems channels partners will become as fleeting as price/performance leadership in the midrange market. Keeping NCR VARs happy will be a major challenge for AT&T.

— continued next page

- **Software:** Perhaps the most strategically important manifestation of NCR's competitive expertise is vertical market software: primarily retail and banking. It claims to have Unix V.4 commitments from 194 VARs and ISVs for 350 different applications. But, again, porting between different implementations of Unix is far easier than other types of ports. So those ISVs and their applications are far from wed to NCR's hardware and Unix.

- **Employees:** the best thing about NCR, it's been said, is top management. But that's precisely what AT&T wants to toss out. If it doesn't toss out its own before this is all over. The accrued expertise of all other NCR employees is impressive, but there's no way of insuring they'll stick around. Those employees can quickly jump ship to other commercial Unix vendors. Companies that are always looking for good software engineers, even in the most lean of times.

AT&T's hostile takeover attempt rides on transforming NCR's assets into long-term, leverageable competitive advantages. AT&T hopes they will rescue its flagging computer business. But that's not a simple proposition.

AT&T's pipe dream of an online ATM in every home may be just that.

It says here that even if the merger clears the financial, cultural and hardware product-line barriers, maintaining excellence at the new AT&T/NCR will be difficult at best and a fleeting attempt at worst.

CEO Chuck Exley is the core of NCR management. Losing him would be disastrous. But that's what, it seems, will happen. After that, how likely is a general exodus from NCR? While whoever stays on might be wholly committed to making the new arrangement work, they might not have had the broad exposure to NCR's operations of Exley's top managers. And AT&T may find itself with but a shell of the former NCR upon which to pin its computer business. Four NCR board memebers are due for reelection on March 1st.

Prodigy's Censorship Nightmare: A Case Study in PR Mismanagement

It began with a full frontal assault on that Holy Grail of many a high-tech segment, the home market. Bright-eyed all-American types peered out into the nation's living rooms and proclaimed over that catchy jingle, "You gotta get this thing!" Less than twelve months later, the *Wall Street Journal* ranked Prodigy alongside Robert Mapplethorpe and 2 Live Crew as yet another instance of the growing issue of censorship.

Something had gone terribly wrong.

The problem started innocuously. Prodigy determined that it could no longer fully support its original promise of a flat monthly fee *and* unlimited electronic mail messages. With over 600,000 users, there were a few, it turned out, who were using the service a lot. With 600,000 users, $9.95 a month (no connect-time charges, and no charges for messages) seemed, to Prodigy, a little cheap. A slight increase was ordered, boosting monthly membership to $12.95 and levying a charge of 25¢ per message for every message over 30 per month.

A company surely has the right to alter its price structure. And indeed, with growth as rapid as it had been, who could blame the joint IBM/Sears venture if finance was a little ahead of advertising. Soon 700,000 Texan prospects were being solicited with ads to join a flat rate service that in fact had ceased to be so, at least for anyone with more than 30 messages a month. And when the Texas attorney general's office protested, Prodigy not only pulled the ad and kicked in $12,500 to the Texan law office's coffers to pay for the investigation, it sent out e-mail to all the recent Lone Star e-mailers who'd responded to the ad offering a complete refund.

But some users were mad. For what appears to be indeed a relatively minor fraction of the now half a million Prodigy users, adding any sort of per-message fee to a service which they had specifically selected for its absence of such a fee was intolerable. And so they protested by sending letters of complaint over the Prodigy system, and cc'ing advertisers on the system. "You gotta get this thing" was a call to arms for the brave new corporate sponsors who would pay IBM/Sears to have a data modemed-advertisement popped up on users' screens, too. This last part got Prodigy mad.

Things looked reasonably bad — bad, but reasonable — and then they got worse. Viewing some of the electronic missives as harassment, Prodigy booted off some users ... the dreaded c-word (censorship) was invoked in well-placed articles in *The Wall Street Journal*, *The New York Times*, and other books of sufficient weight to turn a problem into a nightmare. "Bring back the Prodigy Seven," someone said, and the trade press, of course, ate it up.

"You gotta get this thing."

Prodigy's failure is not in its financial calculations, nor in its procedures and rules regarding what's permissible and what's not on its network. Free speech notwithstanding, the bottom line is it's their network, it's their pricing structure, and they can do with it what they want.

The company can also completely mess up its image, if it wants. Prodigy should not be taken to task for censorship, or a pricing change. It should be taken to task for violating the most fundmental rule of marketing and customer service ever annunciated by a high-priced analyst: *The customer is always right*. Get your customers mad and you're asking for a nightmare. The matter could have been handled far more smoothly. Booting users from the system for sending messages Prodigy didn't approve of is a bone-headed means of handling the potential P.R. crisis. Indeed, it precisely turned a potential P.R. crisis into an actual one.

Prodigy's services are good, its users by and large happy. Hopefully the company will learn from this — not that it can't change prices, not that it can't control the content of what is published in its electronic pages, but that to ever appear as being in a war with one's customers is to completely lose the game. The corporation has to be smart; sometimes you need to lose a battle to win the war. Prodigy should have lost the battle with users on this one, to win the war with its competitors.

Yet, even if Prodigy does learn from this one, there are always other dangers. Like a child buckling under the expectations of having been labelled at too early an age a prodigy, the network may be guilty of an even more adolescent crime. *Soap Opera Now*, a weekly newspaper read by 6,500 soap opera fans, has filed a suit against Prodigy for plagiarism and copyright infringement. According to Managing Editor Michael Kape, Prodigy's recently launched soap opera digest service ran some stories lifted verbatim from the magazine — including one totally false story planted in the magazine to trap the network. Prodigy, apparently, ran that story too.

— David Atlas,
Senior Analyst

Digital paid $230 million for a 65% stake in the Kienzle Computer Systems Division of Mannesman A.G. Proprietary Kienzle systems are currently based on Motorola's 68000 but a transition to MIPS is underway, which will provide some compatibility with Digital's Unix architecture. Mannesman-Kienzle's 1989 European revenues were $123 million in medium-scale, and $104 million in small-scale multiuser systems. Also, Digital's 33-year no layoff policy ended when the comapny announced that by July 1 up to 3,500 (2.8%) workers worldwide will be laid off. The company did not comment on the possibility of further layoffs.

Asparagus off before harvest. Data General announced the termination of a joint ISDN development and marketing agreement with NTT. Project asparagus — because the final project was not expected to come to fruition for two years — was terminated after preliminary research indicated soft Japanese demand.

Pyramid's new Reliant Series system is not fault tolerant. But the dual system configuration does prevent any single point of failure from leading to the loss of data or access to applications. And it puts Pyramid ahead of Sequent in high-availability and data integrity.

Compaq reorganization. With international revenues reaching 50% of worldwide revenus in 1990, Compaq has reorganized its operations under Eckhard Pfeiffer, the former president of its European and International divisions.

MIPS (by Sony) to go. Sony introduced a MIPS R3000-based portable workstation featuring a 1120 x 780 pixel back-lit LCD and 240MB drive for $9,900 and weighing in at about 18 pounds. It will be sold through Sony Microsystems' 24 direct salespeople, 60 resellers and dealers, and OEMs. Take tha,t Sun and IBM.

What else happened in 1990? Lotus and Novell embarassed themselves by touting, flaunting, then decrying a proposed merger, while Microsoft's Windows took the breeze out of IBM's OS/2 sails. Laptops — without IBM — comprised fully one-tenth of the PC market and the superserver phenomena never really materialized. Apple not-so-quietly sold $1 billion worth of it's new low-end product as Chairman Sculley took over the reins as Chief Scientist. Virtual (or artificial, illusory and simulated) reality got big headlines. Unisys gave new meaning to the term "sunk cost:" its market valuation was a fraction of the book value of its buildings and real estate. Siemens bought Nixdorf, Fujitsu bought ICL, and Bull bought Zenith Data Systems. DG actually posted a Q4 profit. All the general-purpose computer companies started talking fault-tolerant, and the fault-tolerant companies started talking "high availability." The Unix companies went both ways. Meanwhile, the OSF finally showed full implementation of its alternative (to AT&T's V.4) Unix and trumpeted the success of Motif and its distributed computing scheme. Everywhere, outplacement departments were busy. Most notable among the litany of layoffs were the departure of a few key executives at Apple (Jean Louis Gasse), Digital (Jack Shields), M&D (Frank Dodge), and DG (Edson de Castro). For the last five months of the year the globe was preoccupied with the specter of middle east war. Even the liberation of Eastern Europe and the unification of Germany couldn't rally the U.S. economy. Sometimes even the information industry — the international economy's most complex business — takes a back seat.

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Toward a Distributed Computing Architecture: So Close and Yet So Far

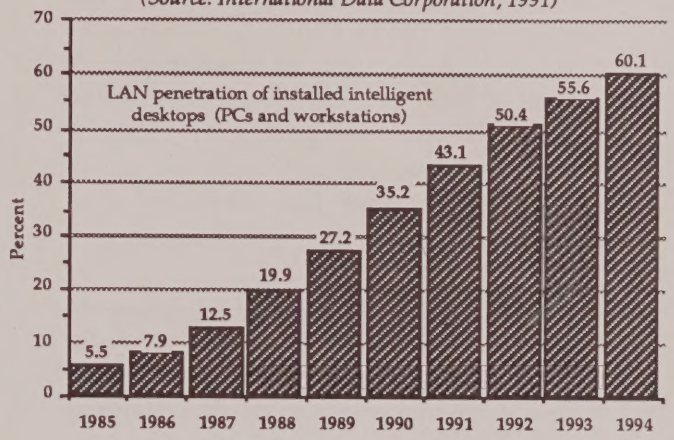
Obstacles to the widespread implementation of the newest computing paradigm will minimize its short-term impact; but the development of key enabling technologies marches forward, and in the meantime it's still a great marketing tool.

Whatever you call it — cooperative, distributed, network or client/server computing — computer vendors have seen the future. Their vision? A heterogeneous mix of low-cost, networked, microprocessor-based computers supporting nonproprietary, robust software platforms and applications with impunity. It is applications running efficiently and securely, whether on a single processor, or across a network. It's the concept of unlimited computing power at the desktop.

The question is, is that vision materializing today, or will it only take shape closer to the year 2000? The answer lies in the horserace-like development of the hardware, software and management components of distributed computing.

Behind the distributed computing architecture (DCA) vision is a lot of unknown, undeveloped, and untested technologies. The full implementation of DCA, and wide-scale development of distributed applications, will require significant developments in diverse, and yet interrelated areas.

LANs: Network Infrastructure for the 1990s
(Source: International Data Corporation, 1991)



Advances in some areas will move rapidly. Others will languish. The impact of the early advances will be muted by the delays.

The result from the user's perspective will be chaos. Organizations that identify critical applications which might benefit from a distributed computing approach will develop point applications limited in flexibility or scope. Uncoordinated efforts will slow companies' overall migration to distributed computing. International Data Corporation, publisher of the *Computer Industry Report*, believes that a viable distributed computing architecture (see definitions, p. 3) will not be in place at most leading-edge organizations prior to the end of 1995. It will permeate the majority of large- and medium-size companies only after 1996.

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IDC **INTERNATIONAL DATA CORPORATION**
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Why the delay? Assimilating a new technology into installed bases is never easy. But distributed computing is more than just new technologies. It's a way of thinking about computers. It's a new computing paradigm that will become the infrastructure for integrating old and new systems, networks and applications. As such, it's implementation depends on breaking old habits and creating new technologies:

Forces Driving Distributed Computing

- **The LAN explosion.** In 1985, 5% of all business PCs were connected to a local area network. By 1990, 34% were, and by 1993 over 50% of PCs will be attached to a LAN. High-speed and high-capacity LANs are becoming the underlying network infrastructure for corporate data communication.

- **Maturation of enabling technologies.** The widespread adoption of modular software design techniques — typified by the growing number of client/server applications — is driving the development of distributed computing.

- **Standardized hardware, software and network interfaces.** More and more users' and vendors' systems and networks use the same underlying technologies.

- **"Displacement" vendors.** The most critical factor facing most computer systems vendors is their installed base of systems, networks and applications. Vendors with no significant installed base of non-open systems and networks have a freer hand. They want to displace the installed systems and applications wherever possible. They are providing the competitive thrust behind the mounting DCA momentum.

Forces Constraining Distributed Computing

- **"Installed" vendors.** Conversely, vendors with a significant installed base must walk a narrow line between continuing support of proprietary platforms and shifting toward more advanced and open platforms. DCA-based systems — carrying lower margins and equally high, if not higher, support costs — represent a potential threat to these vendors.

- **The budget squeeze.** The pressing of profit/loss responsibility deeper into MIS structures disperses purchasing authority and therefore disperses an organization's processing power. Both downsizing (a conscious effort to migrate mainframe applications to smaller systems) and dispersion are dependent upon the development of distributed computing to succeed. But budget pressures limit available resources.

- **Integration into existing IS structure.** Companies with a large base of installed systems might be reluctant to invest in DCA-based systems for two reasons. First, sheer complexity. Integrating the new and the old will be a huge, expensive task. Second, they may delay implementing DCA-based systems until vendors' migration strategies are clearer.

- **DCA system and network management.** Tools for managing DCA-based networks and systems will only be available when DCA itself is ubiquitous. In turn, users will only view DCA as reliable and robust when those tools are available.

- **Potential for vendor instability.** Basing a computing strategy on new technology is one thing, basing it on a new technology and a new company is different. Even the

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Distributed Computing Defined

A wide array of terms are used to describe advanced network-based computing. Many associate the most popular of them, "distributed computing," with specific distributed applications — the best example being Sun Microsystems' Network File System (NFS).

International Data Corporation believes this definition is too narrow. Such applications are, essentially, a downsizing of an isolated application that once resided on a large system onto many smaller networked systems. Promoting the concept of an all-encompassing computing infrastructure demands a wider definition of network-based computing:

> **Distributed computing enables applications to function as consistently on a network of systems as on a single system.**

There are four implications of this definition.

- "Distributed computing" is an architecture or infrastructure upon which a company can distribute any or all of its applications.
- "Distributed computing enables applications" in this definition does not refer to a specific software program like word processing or CAD. An application is a business process involving the interaction of multiple users and multiple software programs.
- "Function as consistently" means that the DCA network and architecture are flexible enough to support many different applications and combinations of applications in a predictable fashion.
- "Network of systems" means that the distributed architecture runs on multiple platforms — PCs, Unix workstations, minicomputers, mainframes and supercomputers — and is supportable across multiple network types.

This definition is consistent with IDC's belief that distributed computing constitutes a new computing paradigm. It gives widest berth to the emerging technology itself, and discounts marketing static.

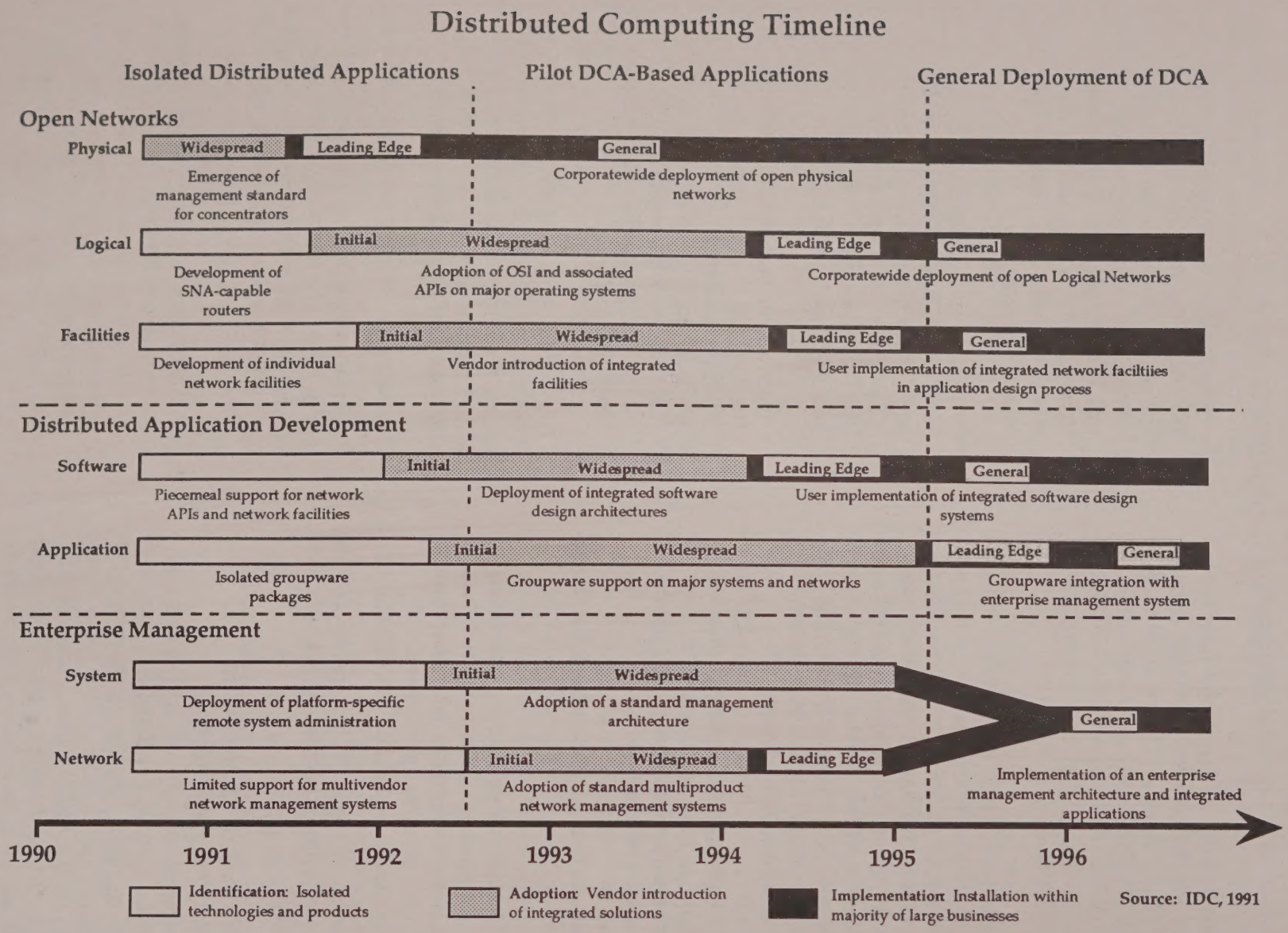
shiniest of new DCA vendors will be viewed with suspicion by potential customers.

The Impact of Distributed Computing Architecture

Distributed computing will lead to new growth in computer systems and communications markets. The emerging concept of distributed applications offers users a new means of increasing return on computer systems investments, but only if the applications are built on a stable, distributed architecture, including:

- Open networks and network facilities that allow processors and applications to communicate with each other regardless of processor type, operating system, or language.
- A distributed application design environment that enables programmers to incorporate standard network facilities into programs and that allows users to easily integrate many different programs in order to perform a specific business task.

continued p. 5


Distributed Computing Timeline
Isolated Distributed Applications
Pilot DCA-Based Applications
General Deployment of DCA
Open Networks
Physical
Widespread
Leading Edge
General
Emergence of management standard for concentrators
Corporatewide deployment of open physical networks
Logical
Initial
Widespread
Leading Edge
General
Development of SNA-capable routers
Adoption of OSI and associated APIs on major operating systems
Corporatewide deployment of open Logical Networks
Facilities
Initial
Widespread
Leading Edge
General
Development of individual network facilities
Vendor introduction of integrated facilities
User implementation of integrated network faciltiies in application design process
Distributed Application Development
Software
Initial
Widespread
Leading Edge
General
Piecemeal support for network APIs and network facilities
Deployment of integrated software design architectures
User implementation of integrated software design systems
Application
Initial
Widespread
Leading Edge
General
Isolated groupware packages
Groupware support on major systems and networks
Groupware integration with enterprise management system
Enterprise Management
System
Initial
Widespread
Deployment of platform-specific remote system administration
Adoption of a standard management architecture
General
Network
Initial
Widespread
Leading Edge
Limited support for multivendor network management systems
Adoption of standard multiproduct network management systems
Implementation of an enterprise management architecture and integrated applications
1990
1991
1992
1993
1994
1995
1996
Identification: Isolated technologies and products
Adoption: Vendor introduction of integrated solutions
Implementation: Installation within majority of large businesses
Source: IDC, 1991

- An enterprise management system providing companies with control over networks, systems and applications based on a distributed computing architecture.

The need to coordinate activities in all three areas, and the threat of potential problems (particularly in the area of implementing common logical networks and network facilities) will delay wide-scale adoption of DCA until 1995 or 1996. These activities will have a major impact on information vendors, but the effect will vary depending on each vendor's current market position.

- Vendors with large installed bases of proprietary hardware systems must respond to the challenge of DCA by protecting their installed bases. They must develop smooth migration strategies that are neither excessively complex or expensive. An important part of their strategies hinges on the degree to which they succeed in leveraging their trained support staff and integration expertise.
- Vendors seeking to displace installed suppliers must focus on overall application development and enterprise administration issues. A critical part of their strategies will be the formation of close alliances with each other, systems integrators and, independent software vendors.

The DCA Challenge

The speed with which a distributed computing paradigm becomes reality depends on how effectively its proponents can effectively integrate it into the mainstream of information systems. That, in turn, implies and depends upon closer working relationships across the industry. And all types of alliances, whether forced or voluntary, are the way to get there. Viewed thusly, DCA becomes more than just new technologies; it becomes an agent for industrywide reformation.

Information in this article has been excerpted from IDC's Strategic Planning Statement on Distributed Computing. Full copies of the 24-page report are available from IDC.

CAD/CAE/CAM Growth Slows Across the Board

Growth in the 1990 CAD/CAE/CAM market slowed from almost 15% in 1989 to 11% in 1990. The overall market, including electronic/electrical and mechanical CAD/CAE/CAM, totaled $10.9 billion last year. IDC believes 1991 revenue growth will slow further, to the single-digit range.

The mechanical segment of the CAD/CAE/CAM market was $6.5 billion in 1990, representing 60.2% of the overall CAD/CAE/CAM market. It grew by 15% over 1989, down from the 30% growth rate of 1988-89. The slowdown in market growth was largely due to the anticipated reduction in defense and federal spending; the slump in the aerospace industry; the onset of the current recession; and continuing platform downsizing from mainframes and minicomputers to workstations.

The electrical/electronic segment was a $2.7 billion market in 1990, a 9.5% increase over 1989 and down from 13.7% from 1988-89. The 1990-91 growth rate is expected to be between 9% and 11%. This relatively sluggish growth rate is due largely to company- and product-specific difficulties experienced by Mentor Graphics, Valid Logic, and Dasix.

Key Mechanical Market Players

The largest player in the CAD/CAE/CAM market, IBM strengthened its long-term position even further by acquiring Cadam, Inc., and by introducing the RS/6000 product line. However, the transition from mainframes to workstations cut into IBM's growth, decreasing its overall CAD growth from 23% between 1988-89 to an estimated 10% between 1989-90. IBM's 1990 CAD-related revenue was $2.2 billion.

Digital's minicomputer sales were hurt by the current downsizing trend. IDC expects Digital's 1990 CAD/CAE/CAM revenue to remain flat at around $1.3 billion.

Hewlett-Packard was hurt by its lack of a competitive RISC-based workstation and by delays in the availability of Motorola's 68040 chips. IDC expects HP's CAD-related revenue to remain flat at around $1.1 billion.

Prime/Computervision introduced important improvements in its software and increased its revenue from $890 million in 1989 to an estimated $900 million in 1990.

Autodesk continued to strengthen its product line and distribution and grew its 1989 CY revenue of $162.6 million by 33% to an estimated $216 million for CY 1990.

SDRC is leveraging its technology leadership in MCAE to become a serious contender for Prime/CV's and Intergraph's customer base. The company grew from $93.6 million in 1989 to $118.6 million in 1990.

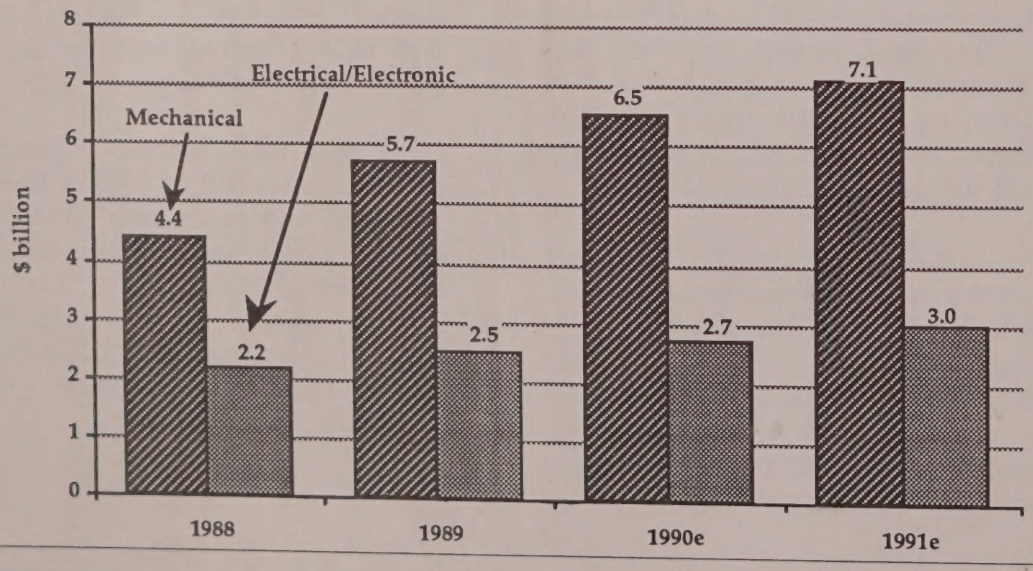
Parametric Technologies continued to expand its product line and grew its revenue by a breakneck 131% to $25.5 million in FY 1990.

Mechanical 1991 Outlook

The recession and further belt-tightening by municipalities and defense will increase competition and reduce profit margins in 1991. Software companies are expected to fare better than hardware companies: 1991 growth rates for software companies will be 13-15%, and hardware companies are expected to grow at 8-10%, leading to an overall growth rate of 9-11% for the mechanical CAD/CAE/CAM market.

Mechanical and Electrical/Electronic CAD/CAE/CAM Market Growth 1988-1991 (est.)

(Source: International Data Corporation, 1991)



Key Electrical/Electronic Market Players

Mentor suffered a one-year delay in the shipment of Release 8.0, reducing its revenue growth for 1989-90 to 2% or $435.2 million. Revenue growth in 1991 will be slow until the company can ship 8.0 tools for the new Sun platforms. On the other hand, the company strengthened its IC product line by acquiring Silicon Compiler Systems, Inc. Valid Logic had to write off its turnkey activities in Q3/90 and is expected to need until Q3/91 to recuperate from this shift in product strategy. In spite of these difficulties, the company managed to achieve relatively encouraging returns in Q4/90 resulting in overall 1990 revenues of $158.5 million, down from $173.9 in 1989.

Cadence increased its (software-only) revenue by 45% over 1989 to $231.3 million. Cadence is not in the midst of a major product revision; it is expanding from a niche IC tool vendor into a full-line EDA vendor; and it does not have to deal with hardware issues as do Mentor and Valid.

Electrical/Electronic 1991 Outlook

IDC expects U.S.-based E/E vendors to have another slow year in 1991 with growth rates between 9-11%. User spending will be under pressure due to the current recession and increased competition. IDC does not expect international competitors to mount a serious challenge to U.S.-based E/E companies in 1991. They will benefit from healthy economic growth overseas to compensate for sluggish U.S. sales. The long-term health of the E/E industry depends on expensive R&D investments, which may force weaker companies to look for partners, reducing the number of independent tool vendors.

— With Gisela Wilson, CAD Program Manager

A New Brigade? Compaq, MIPS, et al.

To straighten out some confusion: Compaq has not yet picked a RISC chip, but the frontrunner is MIPS, particularly since Microsoft is writing portable OS/2 on a MIPS-powered workstation. But Compaq is in no hurry — because of its distribution channels and desired product lineup — to introduce a RISC workstation or server, and we do not expect that it will do so in 1991. Although Silicon Graphics has enacted a poison pill, it has denied it is in merger talks with anyone at this point. It is more likely that Compaq and Silicon Graphics are discussing possible technology licensing agreements.

At the same time, IDC believes that a coalition of MIPS chip licensees (including DEC, Silicon Graphics, and Sony) is working to create a reference model so that software will be more portable across the workstations and servers of each. This combination of negotiations and negotiators has led to a jumble of rumors and speculation, but in all likelihood the combinations have little relationship to each other.

Compaq wants to have a future path of compatible, but differentiated, products in the IBM PC world, as well as a shot at the fast-growing workstation market. But Compaq cannot introduce point products — it is a volume manufacturer. The company needs a product that can play in its current environments — DOS, Netware, OS/2 LAN Manager, and Unix — and be sold by its dealers.

On the Unix side, Sony and Silicon Graphics both want to take advantage of the shipment volumes that DEC is driving. (Large systems customers Tandem and Pyramid are far less concerned.) Before there can be

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IBM trumpets AS/400 success. IBM's Advanced Business Systems (ABS) announced the third consecutive year of worldwide double digit (12%) revenue growth. U.S. market revenue grew 25%. Revenue contribution was 35% U.S., 45% in Europe, and 20% rest-of-world (ROW) with Asia/Pacific taking the majority of that segment. ABS (which includes AS/400, 5363 and AS/Entry hardware, related I/O, software, and maintenance) contributed $14 billion in revenue. IBM will make some major AS/400 announcements in 2Q91 which will provide 25-35% improvement in price/performance. Uniprocessor performance for the 9406 is expected to be in the 30-40% range with a multiprocessor design at the high end providing twice current performance levels. Additionally, we expect memory capacity improvements and a new version of the OS/400 operating system which will support multiprocessing.

HP invests in Informix. Hewlett-Packard announced that, between April and February of 1992, it would acquire up to 5% of Unix database supplier Informix. Informix has the option to put an additional 5% equity (newly released stock) to HP over the same period. The two will do joint development work that IDC believes will be mainly centered around CASE, and HP may bundle some Informix products, though likely not Informix's SQL engine. HP helped finance ASK Computer's acquisition of Informix competitor Ingres last year, but it is clear now that HP was more interested in ASK's MRP software than in Ingres' database. HP and Informix are jointly positioning their CASE environment as a framework in which other companies' CASE tools can fit, and the investment will further that movement. HP is interested in Informix's database for imaging applications, and may even be toying with the concept of offering Informix products as a Unix CASE repository, not unlike IBM's AD/Cycle. However, that would be well in the future.

Novell and IBM tie some knots. Novell and IBM announced that, starting immediately, IBM will sell Advanced Netware and Netware 3.11. The two also made several important promises, including: Novell development of shrink-wrapped versions of Netware 386 for OS/2 and AIX for the RS/6000 (delivery in 1992), improved interoperability between LAN Server and Netware; improved interoperability between Netware and Netview. Although not explicitly mentioned, Novell is still working on an AS/400 version of Portable Netware. For IBM, the agreement is a recognition that limited acceptance for the LAN Server product (estimated 2-3% of LAN clients installed in 1990) is seriously affecting IBM in large accounts. For Novell, the agreement represents an IBM stamp of approval for Netware. It increases the chances that Netware will retain its 50%+ market share and strengthens its position as a critical product in large corporate networks.

Compaq/MIPS, cont.

shrink-wrapped MIPS software, there must be an agreed upon, common set of programming interfaces above the operating systems and graphics environments, or a common porting base.

Although from MIPS's point of view the more the merrier, this potentially potent gang of companies has several conflicting motivators. The Unix-oriented group would like to solve its problems with interfaces, but a common OS and graphics environment is the only proven way to shrink-wrapped software. Thus, deciding whose Unix and whose GUI could slow the whole process. Windows — Compaq's preference — was never intended to be networked. Given these hurdles, we believe the combined efforts could result in a pair of reference models (one Unix, one DOS-OS/2) late this year. Products would be at least 12-18 months behind that.

THE GRAY SHEET
Computer Industry REPORT

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D.B. McLEOD, EDITOR MARCH 1, 1991 • VOL. 26, NO. 12 *Published Continuously Since 1964.*

Unix Hardware in 1990: Top Three Drive Strong Growth

Sun, HP and IBM contribute $1.5 billion — over 60% — of new Unix hardware sales; the 1991 challenge: can Unix hardware make further inroads in commercial accounts?

Fueled by workstations, servers, and PCs running Unix, worldwide Unix systems market growth continued to outpace overall hardware sales. The value of Unix systems shipped in 1990 grew 21%.

The growth was somewhat less than IDC expected, largely because PC Unix growth slowed faster than expected. In addition, demand for medium-scale Unix systems — particularly in Europe — fell short of expectations. Some highlights from the 1990 Unix hardware market:

- **Workstations still dominate the Unix market,** with over $6 billion in 1990 sales.
- **Growth in PC-based Unix** systems slowed from 50% in 1989 to 25% in 1990.
- **The small-scale segment grew fastest — 27%** (to $5.1 billion), primarily on the strength of workstation servers from Sun, IBM's RS/6000, Compaq's Systempro, and HP's Unix minis.
- **Despite high growth rates** from medium-scale players Pyramid (74%) and Sequent (63%), the medium-scale Unix market only grew 12%.

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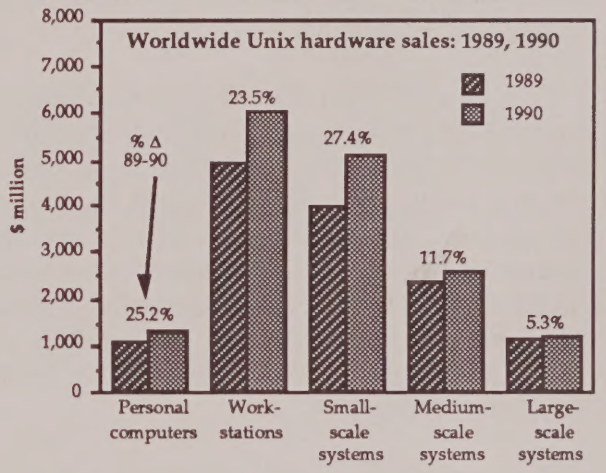
Unix Hardware: Growth Across the Board
(Source: International Data Corporation, 1991)



- **Leading vendors Sun, HP, and IBM** made up nearly 60% of the $2.8 billion in Unix systems growth.

Political uncertainty and economic hard times will continue to affect large purchases in 1991. IDC does not believe the market for medium- and large-scale Unix systems will rebound until the second half of 1991 at the earliest.

Even then, Unix will see only moderate acceptance on commercial desktops in 1991. Fierce price competition, and the slowing of the workstation market, lead IDC to forecast slowing growth in Unix hardware in 1991. IDC expects the value of systems shipped will grow between 15% and 20%.

IDC INTERNATIONAL DATA CORPORATION
5 Speen Street, Framingham, MA 01701 / (508) 872-8200

No Unix on the Desktop — Yet

Products such as Open Desktop from the Santa Cruz Operation (SCO) and Unix System V.4 have the potential to make Unix a popular desktop operating system. But in 1990, PCs running Unix continued to be installed for primarily multiuser applications.

Open Desktop (and application software to make it useful) is taking longer than IDC expected to reach the market. While these products are making progress and will contribute to the growth of the market somewhat in 1991, their contribution will not be significant until 1992.

Last year, IDC forecasted growth of multiuser PCs to remain near 50% in 1990, but to slow to 25% in 1991. The forecast was based on the assumption that it would no longer be possible to fuel fast growth at the expense of an already decimated small-scale market. However, growth actually slowed earlier than we expected, to near 25% in 1990. Moderate Unix multiuser PC growth will continue in 1991.

Commercial workstations have the most potential to bring Unix to the desktop. Sun's Sparcstations are the most likely products. Sun's three major product announcements in 1990 (Sparcstation SLC, IPC, and 2), proved that it can continually update its product line to deliver increases in performance and function at price points appropriate for commercial users. Sun also shored up its distribution strategy — in hopes of better addressing commercial markets — by signing agreements with MicroAge, Nynex, and Intelligent Electronics.

Unix Makes Gains in the Midrange

Revenue growth in the 1990 worldwide midrange market was just 1.3%. In spite of such a sobering scenario, the Unix midrange grew 21.6% from 1989 to 1990.

Workstation servers gave new life to the small-scale Unix market. Including workstation servers, the market grew at 27%. Without them it grew at just 11%. Sun sold more than 60% of the total ($490 million of nearly $800 million), and was the leading small-scale Unix supplier in 1990. Another potential server — the Compaq Systempro — made a significant contribution to the small-scale Unix growth with $130 million in revenues in its first year, but it was sold primarily as a traditional host in 1990.

Hewlett-Packard showed the strongest performance in selling Unix multiuser systems, with over $600 million in Unix midrange revenues, up 60% from 1989. IBM's RS/6000 also spurred growth in the Unix midrange, with $315 million in multiuser systems and $85 million in workstation servers.

But There's Trouble at the High End

Unix systems costing more than $100,000 performed worse than IDC expected in 1990. Last year, IDC projected 23% growth in medium-scale systems. The market grew by only 11.7%. We believe the slower growth is a result of fierce price competition as well as slower-than-expected growth in end-user demand. Of course compared to zero growth in the overall medium-scale market, it still looks good.

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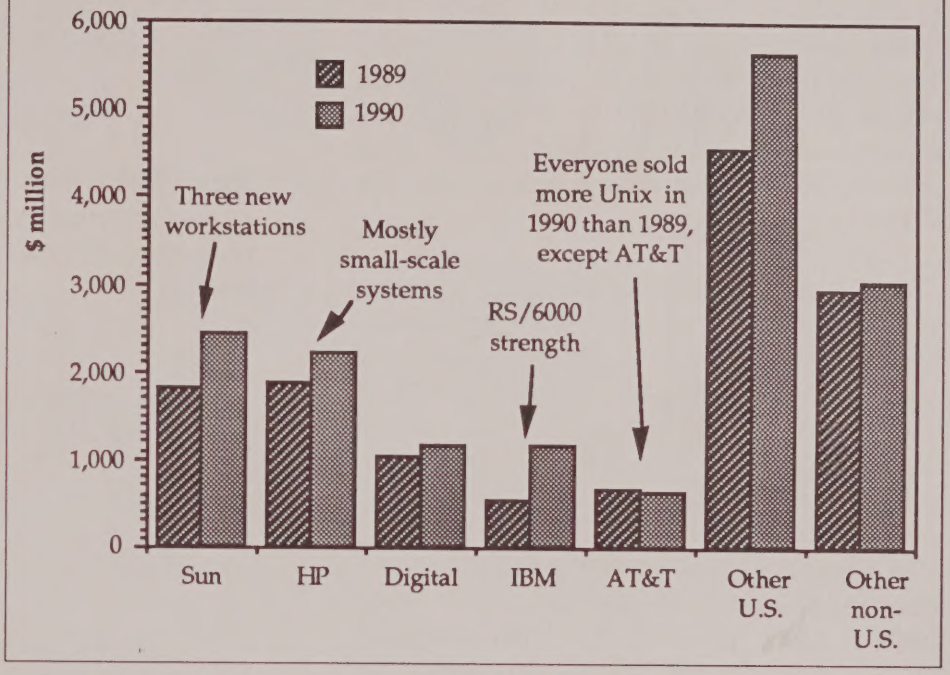
Pyramid and Sequent continued to post growth rates that significantly outpace the market. However, with a combined medium-scale market share of only 15%, these companies are too small to drive the market. Much of their growth was sales to OEMs AT&T and Unisys, respectively.

Worldwide Unix Hardware Market Share Leaders: 1989 and 1990

(Source: International Data Corporation, 1991)



In both cases, the OEMs sold fewer of their own systems (or, in the case of Unisys, fewer of NCR's and Arix's systems) as a result of taking products from Pyramid and Sequent, so the fast growth seen by the manufacturers did not necessarily contribute to market growth incrementally.

Pyramid's sales to AT&T would be hurt long term by an AT&T/NCR merger, and Sequent has already seen that it can't count on the Unisys business. The next year will be a critical one for these two high-end open systems companies, which face significant challenges in reaching critical mass in the wake of increasing competition from Sun, Hewlett-Packard, IBM, and Digital.

Growth in large-scale Unix systems, at 5.3%, also fell short of IDC expectations. As expected, Cray grew slightly and Amdahl, with its new Unix-only boxes, made significant gains. Large-scale Unix suppliers in Japan did not grow significantly in 1990.

Leaders are Emerging

Together, leading vendors Sun, HP, and IBM contributed more than $1.5 billion to Unix market growth, representing 60% of the $2.8 billion increase in Unix sales.

With strong product and market momentum across its line, Sun reclaimed its #1 spot in the Unix market in 1990, displacing Hewlett-Packard. Sun's continued success depends on keeping its desktop products competitive, migrating successfully to Unix System V.4, and bringing a strong high-end (still costing less than $200K) commercial server to market.

Hewlett-Packard, the leader in 1989, was hurt in 1990 by slow workstation growth of only 7%. However, strength in all other segments allowed the company to ship an impressive $2.2 billion worth of Unix-based systems in 1990. HP boasts the most mature Unix multiuser line that is aimed at commercial users; the company is also in the enviable position of being able to sell both its MPE systems and Unix-based systems successfully.

HP's position in the Unix market will be

greatly strengthened if it can make the new low-end RISC systems play better with the multiuser line.

IBM was the big success story, jumping from #6 in 1989 to third place (tied with Digital at $1.15 billion) in 1990. On the strength of the RS/6000, IBM's Unix sales grew by 117%; IBM now has market share (7.1%) and momentum.

Digital gained share in the Unix workstation market, but lost share in the midrange. The company's overall Unix revenues grew more slowly than the market, at 10% in 1990. Digital's DECsystem line has seen a slow start, accounting for $115 million in revenue in 1990.

IDC believes the DECsystem products are suffering because Digital maintains three distinct Unix product lines (MIPS-based, VAX-based and Intel-based), diffusing the efforts of third parties, as well as DEC's own sales force.

Digital's efforts to amass workstation software were thwarted by ISV enthusiasm for the RS/6000, which they now see as a higher priority. The relative successes of Sun, HP, and IBM are a serious threat to Digital's leadership position in the Unix market.

Key Questions for 1991

Over the next three to six months, the important questions to answer include the following:

- Will SCO (with Open Desktop) and Interactive Systems (with System V.4) successfully push Unix as a desktop OS?
- Will Sun and its competitors make significant progress in selling workstations and servers for commercial applications?
- Will new, more powerful products from Pyramid and Sequent stimulate high-end demand?

— With Maggie Konner

370/Architecture DASD Market: 1990 Review

Fueled by a steep 3390 ramp, IBM's DASD business performed ahead of expectations in 1990 and prompted significant market growth. The company remains the only volume supplier of 3390/3990-class products and has held its lead in the DASD market longer than IDC initially estimated it would.

Compatible device supplies remained in short supply last year; they will likely improve this spring as HDS ramps production. Nonetheless, pricing and market share continue to favor IBM. The company's DASD business will likely flatten in 1991, while those compatible suppliers able to execute on 3390 strategies will prosper.

Key Market Highlights

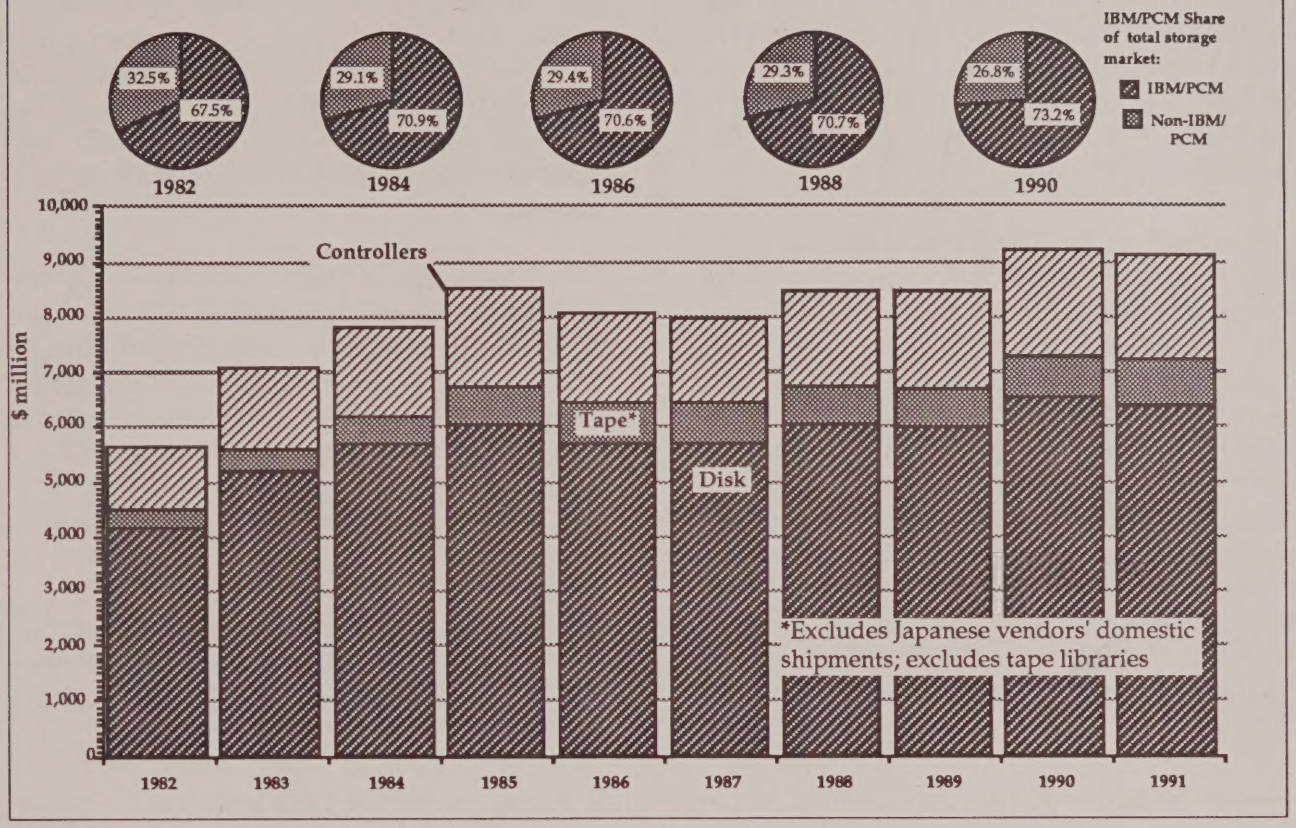
- 3390 product cycle gives IBM a lift
- Compatible DASD competition remains supply constrained
- Robust 1990 market growth is not sustainable
- Removing architectural barriers remains a catalyst for growth

1990: A Good Year for IBM DASD

Demand for IBM DASD outstripped supply last year as IBM tested the price elasticity of DASD with a Q4 price incentive which

Worldwide Large-Scale Storage Revenue* 1982-1991 (est.)

(Source: International Data Corporation, 1991)



appears to have been successful. IDC's research indicates that IBM shipped approximately 18,500 3390 boxes worldwide in 1990 with an average capacity of roughly 20GB per box (earlier estimates called for 16,500 boxes at roughly 18GB per box).

The additive impact of a few thousand 3380 box shipments places IBM's worldwide 1990 large DASD gigabyte shipments at nearly 400,000, up more than 40% from 1989. In addition, we believe customers held on to older technologies (3380s) longer than we initially anticipated and, as a result, installed gigabyte growth slightly exceeded our earlier estimates of 25%.

It is likely that IBM's DASD business will moderate considerably in 1991 as the company's 3390 device enters its second full year of production. The second year of a product cycle typically brings slower growth because average device capacities (and thus average prices) remain relatively constant. Additionally, the cost of acquiring DASD (later in the cycle) increases as lessors are less willing to invest in an older technology thereby shifting a larger burden to the customer (which inevitably hurts overall demand).

Consequently, we expect further price and market basket concessions in the next several months in an effort to stimulate DASD demand. The recession looms as a significant factor because pricing actions typically prove less effective in a bad economy. Moreover, "3391" watching, as well as competitive factors, is likely to negatively impact IBM's performance in the second half of this year.

PCM Miscalculations: A Good Year Could Have Been Great

Overall, three factors significantly hurt the PCM DASD business in 1990: (1) PCM inability to meet 3380K demand, (2) the inability of PCMs to meet 3390 manufacturing targets, and (3) lack of full function 3990 controller capabilities.

The demand for 3380Ks held firm in 1990, mainly because used 3380Ks were in short supply for much of the year. PCMs were largely unable to respond as K-compatible build plans were conservative. Hitachi's plans to wind down Ks in anticipation of 7390 shipments and Fujitsu/Amdahl's prudent K manufacturing plans were primary contributors to the shortage. Despite the conservative posture of both Japanese suppliers, Amdahl and HDS had record DASD sales in 1990.

Although StorageTek actually had K inventories in the first half, most customers are focused on the company's next generation "Iceberg" product (which will not be available until next year). Consequently, the company's DASD business continued to wind down according to plan, and STK (as well as Memorex/Telex and EMC) remained minor factors in the overall supply equation.

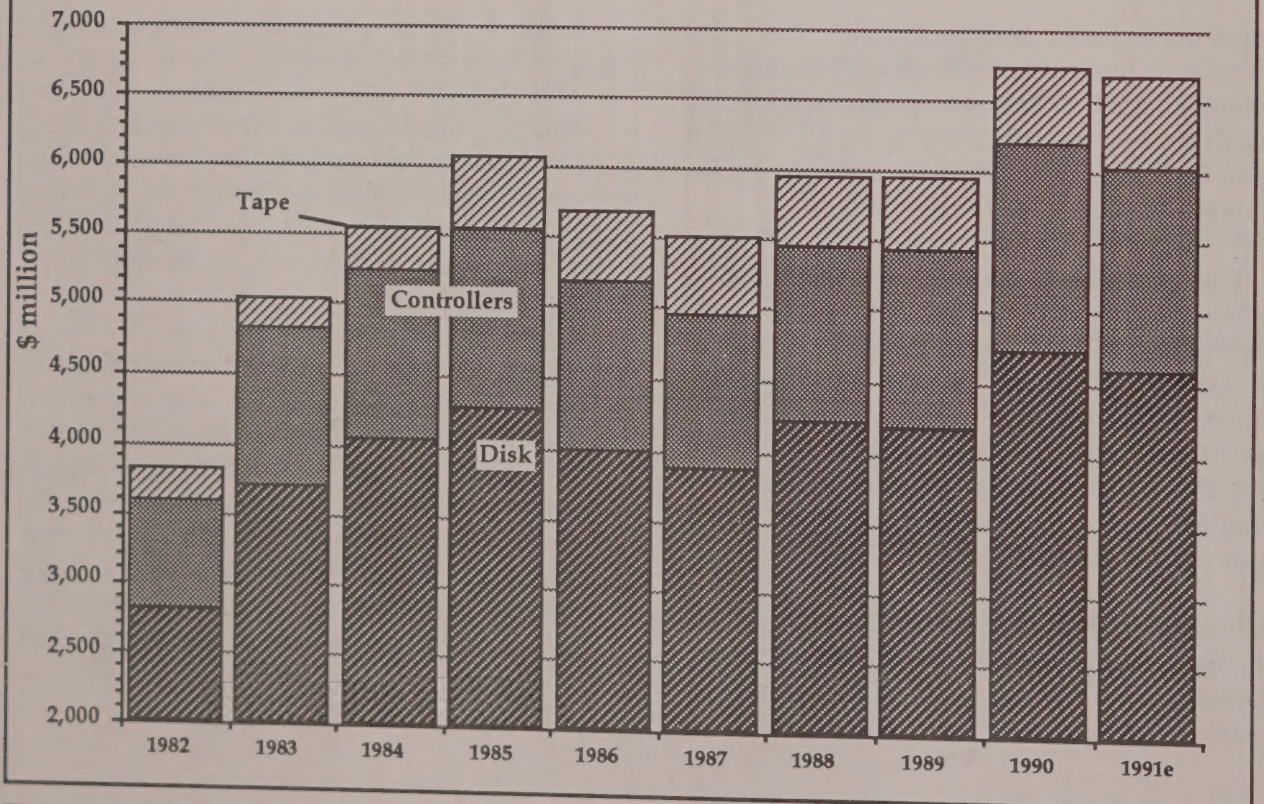
The competitive DASD posture of PCMs is improving as companies struggle to match the 3390. But because PCMs remain unable to ship equivalent 3990 controller functions, IBM's 3990 functions remain a competitive advantage.

1990 Shows Impressive Growth

Table 1 depicts IDC's latest view of the 370/Architecture DASD market in the context of all large-system storage revenue (ex-

Worldwide IBM and IBM/PCM Large-Scale Storage Revenue 1982-1991 (est.)

(Source: International Data Corporation, 1991)



cluding captive Japanese company shipments in Japan). We note the following points with respect to these figures:

- Revenue from 370/Architecture storage devices (DASD, tape and DASD controllers) grew an estimated 13% in 1990, primarily on the strength of IBM's 3390 and 3990 controller.

- Our preliminary estimates indicate that IBM's share of 370/Architecture storage revenues surpassed 85% for the first time since 1986.

- 370/Architecture storage revenue, as a percentage of all large systems storage revenue, demonstrated significant market share gains for the first time since 1983 — the first full year of original 3380 shipments. This is partially a function of currency fluctuations (i.e., converting non-U.S. suppliers' revenues into depreciated dollars) but also highlights the impact of a new DASD product cycle.

- The 370/Architecture DASD market (and the large storage market in general) will likely flatten in 1991 and will not recover until shipments of a mid-life 3390 kicker and a 5.25"-based, low-end mainframe DASD box contribute to revenue in 1992. Our outlook continues to call for these two products to be announced in late 1991.

Conclusions

Although 1990 was an excellent year for IBM DASD, the company continues to operate in an environment characterized by wild fluctuations in year-to-year growth.

For the coming decade, we believe IBM will strive to replicate its consistent, predictable rental revenue streams of the late '70s and early '80s by speeding up product cycles and allowing customers to acquire capacity in less bulky increments.

On the processor side, IBM's "bridge and grow" strategy is supporting this initiative, but to date IBM has been unable to demonstrate similar successes with DASD.

Customer ability to absorb new DASD technologies remains constrained by the limitations of IBM's CKD architecture. Clearly device independence is still several years away, and while the acceptance of base DF/SMS code is progressing rapidly, full exploitation of SMS at most customer sites is lower than expected.

Consequently, IBM's introduction options remain somewhat constrained. IDC continues to expect at least one more iteration of 3390 technology (with no change in device geometry) as well as a low-end 5.25"-based CKD device this year.

It is clear that customers are still several years away from an environment which is characterized by device independence, short product life cycles, and rapid introduction of new technologies. Nonetheless, the positive fundamentals of the large storage market remain largely unchanged and present excellent opportunities for both IBM and its competition.

IDC continues to expect installed gigabyte growth rates above 25% in the 1990s as customer commitments to large enterprise mainframes are supported not only by new technologies (ES/9000, ESCON, data in memory, cache controllers and future RAIDS) but also emerging applications like imaging.

— With David Vellante

Compaq's new channel and end-user support programs are just another way to get more out of downstream partners and customers for less. They shos why Compaq's still on top. Sole reliance on dealers was Compaq's first wise choice. Further "empowering" them to help themselves may be the next. Compaq has never really suffered from its historical reliance on channel partners for integration and customer support. In fact, it has regularly outgrown the rest of the PC industry. But selling PCs isn't as easy as it used to be (*CIR* 25:6 and 26:22). The integration of PCs into ever more complex networks is a natural corollary to one assumption that's driving the PC industry: namely, that networked PCs ought to support formerly minicomputer-based applications, and replace minicomputers themselves. So, Compaq rolled out two end-user support packages (one free, one sold through dealers) that are similar to those offered by some of its largest dealers (Nynex's Star Support, ComputerLand's Answerpac, Businessland's Gold Support). And it announced a program which formally identifies top LAN resellers. Compaq will give those "Specialized Dealers" advanced technical integration information, preferred referral status, and a special Compaq logo which indicates that dealer's expertise.

Apple shipped a "near final" version of its late and still-delayed System 7 operating system to about 13,000 Macintosh hardware and software developers. Oxymoronically speaking, Apple hit it big with this announcement. If ISVs everywhere only knew what a "nearly final" operating system is, they could have begun those ports months ago. But that's a job for Chief Scientist Sculley. Reminds us of the old Big Brother commercial: who's doing the newspeak now?

Digital's new workstations will be based on the new MIPS' R3000A and will perform close to, or just below, Silicon Graphics' 4D/35 Personal IRIS system announced in October 1990. First shipments will use the 33MHz R3000A, but a daughter-card swap/upgrade will allow initial buyers to move right into the 40MHz implementation. The new products (DECstations 4100?) are expected to replace the existing DECstation 2100s. IBM announces a new RS/6000 workstation model next week.

MIPS may have the first 64-bit microprocessor, but it will not have 64-bit compilers, operating systems and applications until 1992. While systems using the R4000 as if it were a 50MHx R3000 may appear toward the end of this year, a lack of tools across hardware suppliers who use MIPS — Digital, Silicon Graphics, Sony, Tandem and, soon, NEC and Pyramid — will delay 64-bit applications until late 1992.

Is Microsoft winning or IBM losing? Or, vice versa? Incoherent rambling in the trade press and elsewhere isn't helping. It's simple really: both IBM and Microsoft have finally realized the MS-DOS/IBM-PC miracle will never happen again. The current row is just the next manifestation of that fact. Is this news? Of course not. Both have been looking out for number one for years. Neither really managed to harbor hope that OS/2 would succeed to the extent DOS did. Sure, maybe IBM thought it could freight-train unsuspecting customers into SAA through OS/2, but that says more about how IBM views its customers than about the IBM/Microsoft alliance. So the "special relationship" is slowly dying. Good riddance. Here's where things stand: DOS owns the desktop — now and forever; Microsoft's "Windows 32" is really OS/2 plus Windows, not just DOS evolution (RIP P.M.). The disaster of OS/2 provides enough "how-not-to-sell-operating-systems" lessons that AT&T might sit up and take notice.

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D.B. McLEOD, EDITOR MARCH 15, 1991 • VOL. 26, NO. 13 *Published Continuously Since 1964.*

1991 U.S. Information Technology Industry Outlook: If This Is Depressing, Be Happy You Don't Sell Cars

The United States' information technology (IT) industry is under siege. Worldwide growth is down across all segments. The bleak outlook at home — flat 1991 mainframe and midrange projections, meager PC growth, distribution channels in flux — portends poorly for the domestic IT industry.

But is the U.S. computer industry really on a downward slope? Have fundamental market conditions changed to the extent that the U.S. IT industry's long-term health is in serious doubt? Or, are the Wall Street bulls on to something?

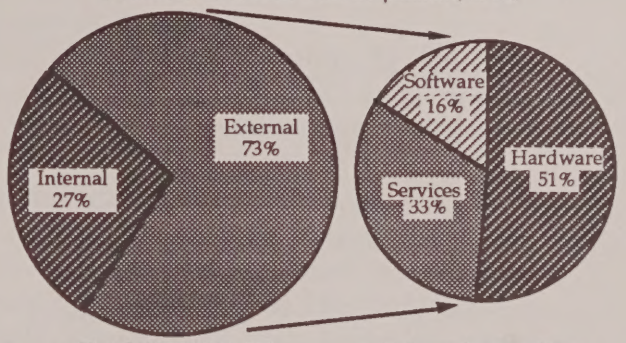
IDC recently surveyed over 1,800 U.S. corporate users of information technology to assess domestic short- and long-term spending intentions. In addition, U.S. IT markets are more than likely a bellwether for worldwide markets. The bottom line: it can safely be said that while the outlook might have been brighter in times past, it is certainly far from pitch black in the beginning months of 1991. Among the more interesting findings of the survery:

- **Only 22% of respondents reported they were "delaying or slowing any IS purchase** or development activities due to the weak economic climate and the instabilities in the Middle East." Over three-quarters of respondents said the current world climate would have no effect on the IS plans. All interviews took place between November 15, 1990, and January 7, 1991 — before the gulf war actually began, but also before any stock market recovery, when oil was over $30/barrel and at least as much economic pessimism existed as today.

- **Only 40% of respondents reported that the recession was an important factor** in making budgeting decisions. Effect of the recession ranked fourth behind the organization's current performance (mentioned by 76%), corporate desire to control IS spending (52%), pressure from competition (40%).

- **Just 17% of respondents indicated their IS budgets for 1991 will decrease.** In addition, the percentages of increases, decreases, and no changes are not significantly different from previous years' surveys.

Where It All Goes: U.S. IT Spending
(Source: International Data Corporation, 1991)



Total 1990 U.S. IT spending: $150 billion

External spending: $110 billion

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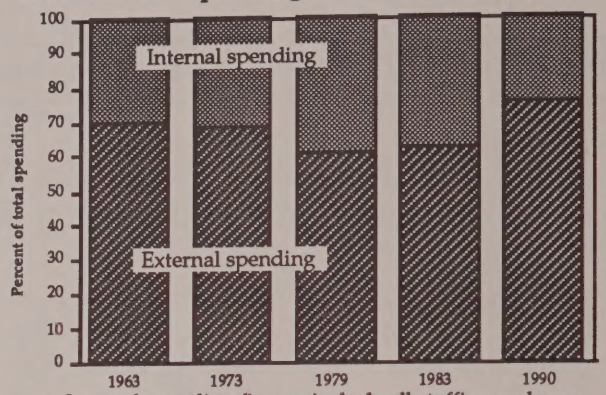
- **The U.S. PC market is not saturated.** Only 28% of respondents felt their organizations were "essentially saturated with PCs." That means there's still plenty of room for PC growth.

The U.S. IT outlook has a shinier underside than popular prognostications might indicate. Indeed, a look at U.S. IT companies further reveals signs of a very healthy industry:

- **The U.S. IT industry grew 7.3% from 1989 to 1990.** Growth over the previous period was slightly lower.

- **While the combined markets of western Europe surpassed the U.S. in raw size for the first time in 1990, that was almost exclusively accounted for by currency exchange rate fluctuations.** Real growth is only slightly higher than U.S. growth. The U.S. is not feeling the effects of a worldwide slowdown alone.

External MIS Spending Is More Than Ever Before



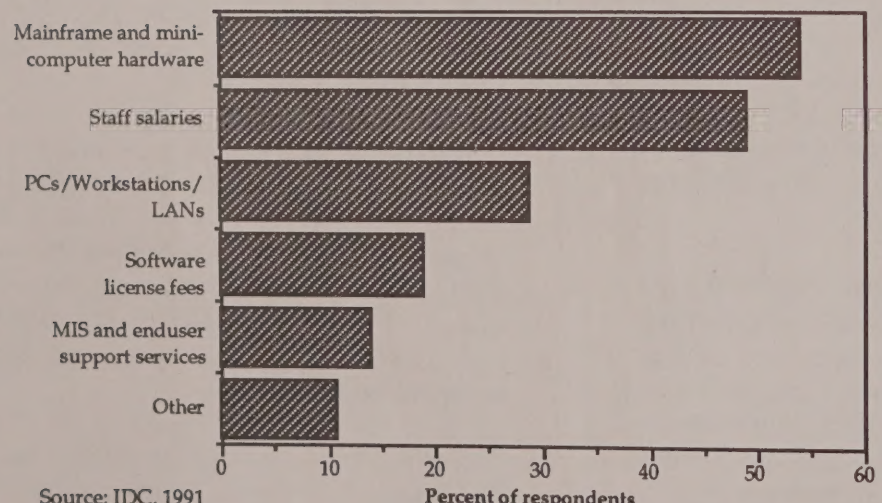
Internal spending figures include all staffing and overhead expenses. External spending is all other MIS-expenses. Source: IDC, 1991

- **A 6% growth rate projection for 1991 — three times some 1991 GNP growth predictions — still isn't so bad.** Companies that planned on sustained double-digit growth — in perpetuity — probably deserve to be scrambling now.

- **Pretax profit margins are holding steady.** A survey of 31 leading IT vendors that reported results for each year from 1985 through 1990 shows that pretax margins were only little lower than normal at 10.3%.

- **Software and services remain highly profitable.** Software companies achieved pretax profits averaging over 15%; service- and integration-related companies' profits have held steady within one point of 12% over the last five

In Which Areas Are You Facing the Most Significant Budgetary Pressure?



Source: IDC, 1991

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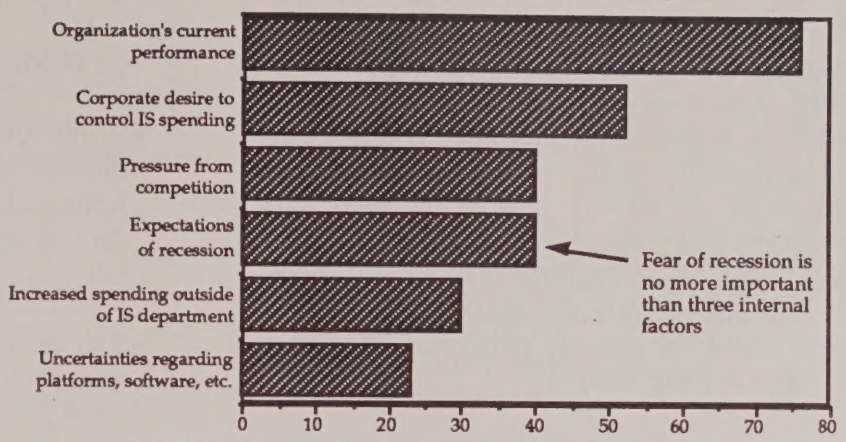
years. Companies like DEC, HP and IBM are finding nonhardware revenue streams are more than just a nice kicker to the bottom line. Those businesses are becoming increasingly strategically important to systems vendors.

What Are the Most Important Factors in Your Budgeting Decisions?



Source: IDC, 1991

Sure, the industry's got problems. Sure, a stagnant economy means trouble. But the underpinning of the U.S. IT industry remains very solid. Corporate buyers of IT are not cowering in the face of an economic slowdown. The major factors that they indicate influence their buying intentions have not changed appreciably from past IDC surveys.

Major IT Customer Issues in the Early 1990s

Instead, they identify a host of issues — *migration to open systems, adoption of client/server technologies, use of systems integrators or outsourcing suppliers, and the decision to centralize or decentralize MIS* — which play at least as great a role in making purchase decisions as general economic health.

Rates of **Unix acceptance** vary dramatically between customer bases. It is not surprising that other minicomputers, VMS, and other mainframe sites lead the way. These bases have traditionally been aggressively sought after by Unix vendors. However, the interest in Unix at IBM S/370 sites is substantially higher than over the past several years. While not necessarily indicating interest in Unix data centers, it is an indication of the increasing use of Unix for commercial applications.

Percent of Sites Actively Pursuing a Unix-Based Open System Strategy

Minicomputers (non-IBM,non-DEC)	31%
DECVMS	27%
Non-IBM Mainframe	25%
IBM S/370	21%
IBM AS/400	6%

Source: IDC, 1991

In addition, roughly half of the respondents believe they are moving, will move, or would like to move toward **client/server computing**. Since client/server means different things to different people (*CIR* 26:11), these results are perhaps best seen as perceptions useful for marketing purposes.

Contrary to some popularly held views, there will not be a runaway movement toward the use of **systems integrators**. About 85% of respondents indicated they had no plans to use integrators, roughly the same as in past surveys. Nine percent are currently using systems integrators, while 6% are considering using them.

Compared to past years, interest in **outsourcing** is on the rise. About 8% of respondents are actively pursuing an outsourcing strategy, and 14% are considering doing so, while 78% have no interest in outsourcing.

As has been the case for most of the computer industry's history, there is no dominant pattern of customer movement toward more **centralized or decentralized MIS** structures. A slight movement toward decentralization of S/370, DEC, and Unix environments was indicated.

Worldwide PC Markets in 1990: Slowing Unit and Revenue Growth

Worldwide PC unit sales grew by 9% in 1990, while revenues jumped 18%. Both figures are somehat lower than expected due to increased scrutiny of new product purchases in the second half of the year and steep price declines in 80386SX-, 80386DX-, and 80486-based systems. The fourth quarter did not provide the usual sprint-to-the-tape boost to overall performance. Some highlights from 1990:

- Strong new product cycles — notebooks, 80386SX desktops and 80486 PCs — were not enough to offset the general slowdown.

- IDC's user surveys showed a distinctively more conservative and strategic PC spending pattern in 1990. They indicated users will continue to invest in connectivity products.

- While the Macintosh Classic enjoyed a blockbuster fourth quarter, consumer/household-targeted machines in general do not appear to have had a strong finish.

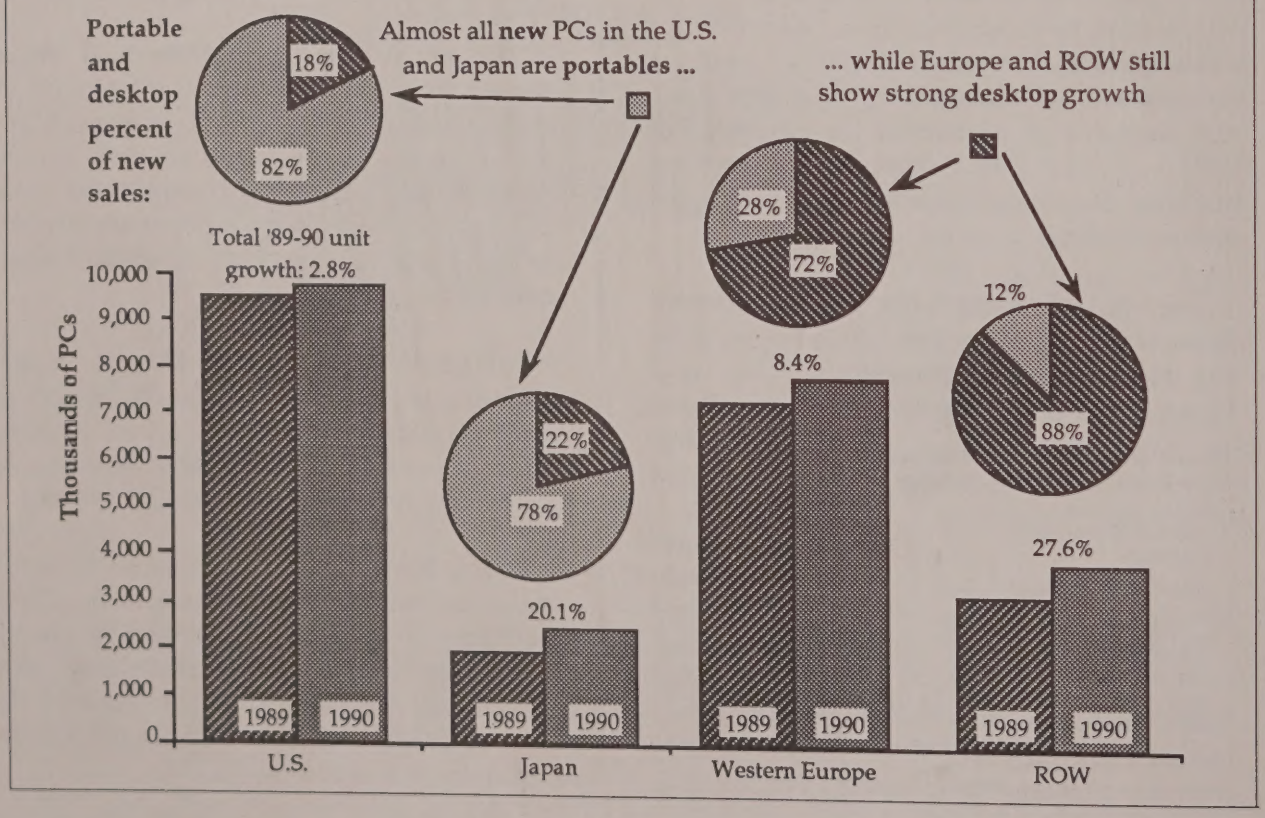
- The effects of the U.S. recession and a generally gloomy economic outlook may have played a role in slowing worldwide growth.

Can Portables Save the PC Industry?

While very strong portable growth offset leveling desktop PC markets, IDC continues to feel that the PC industry has entered a significant period of slower growth and maturation. Many of the trends we have

PC Growth by Region: 1989-1990

(Source: International Data Corporation, 1991)



identified previously — pinching profit margins for dealer/distributor channels, accelerating product life cycles — are reshaping PC growth opportunities. Companies will only find double-digit growth rates in specific niches: notebooks and specialized servers, for example.

Notebooks: More Fun in '91

Portable PCs, led by notebooks, remained relatively immune to the maturation that has struck the rest of the PC industry — a trend that seems likely to continue at least through 1991.

Notebook growth in 1990 was marked by a rapid influx of new brands. Approximately 50 notebook vendors will be selling in the United States alone by the end of 1991. The bulk of 1991 notebooks will be 16- and 20MHz 80386SX-based systems.

DOS portables dominated the 1990 market. In Japan, NEC and Seiko sold NEC desktop-compatible notebooks, while in the U.S. Tandy's proprietary portables continued to lose ground to DOS-based notebooks. Apple sold approximately 40,000 Mac portables in 1990 and is expected to introduce a Macintosh with notebook features before the end of 1991.

Japanese demand — because of the premium for space on desktops — will continue to be strong.

Consolidation in the LAN Messaging Market

Lotus Acquires cc:Mail, Microsoft Counterpunches with Consumer Software's Network Courier

Lotus and Microsoft are reshaping the balance of power in the LAN-based electronic messaging market. Simple. Lotus bought cc:Mail, so Microsoft had to go after its own successful LAN front-end e-mail vendor. Bingo: it happened during the two-and-a-half weeks after Networld Boston, when Lotus's buy was announced. Microsoft bought Consumer Software's Network Courier. If, then. Cause: effect.

But major acquisitions are rarely all tactic and no strategy. This is no exception. In fact, **the acquisitions are the logical continuation of market and technological trends that have been slowly gaining momentum for some time**:

- Within the past 12 months LAN-based e-mail has come to be seen as a critical application among users. As the market has taken off, mainstream vendors like Lotus and Microsoft had to have strong products.
- One corollary of the growth of client/server messaging and the splitting of mail responsibilities into a back-end connectivity camp and a front-end user agent group is the inevitable evolution of the front end. The new front-enders like Lotus and Microsoft are operating in a much different market than traditional e-mail companies.

Lotus and cc:Mail

It was not Lotus Development Corp.'s worst year. But 1990 may have been its most embarrassing. The Novell mega-mismerger did more to dull Lotus's already-faded luster than years worth of late beta shipments did. It rendered Lotus's attempts to diversify away from sole reliance on 1-2-3 revenue the butt of jokes throughout the industry.

No more. Lotus will shortly own about 38% of the LAN-based e-mail market. Even though 1-2-3's estimated proportional contribution to '91 revenue will only drop by

about three percent over comparable 1990 figures, by buying e-mail vendor cc:Mail Lotus has added instant credibility to the low end of its groupware product line. Lotus has assured itself an important spot in an even more important — and growing — market. Consider Lotus's new competitive scenario:

- **Instant presence.** Lotus rocketed its ownership of LAN-based messaging seats to 38% of year end 1990 installations with the addition of cc:Mail's 800,000 seats. There are currently about 35,000 Notes users.

- **Instant synergy.** For the past year Lotus Notes and cc:Mail have been functional allies. The two products are no more competitive than are the acts of having a meeting and sending a letter and are, indeed, as complementary. Typically, Lotus finds itself with a large company very interested in installing Notes in a certain minority of seats — 200 to 2,000 users, perhaps eventually representing 5-30% of the company's population. For the rest of the company, MIS wants something simpler. Lotus now has the opportunity to construct an almost unstoppable LAN-based messaging product line.

- **Instant strategic advantage.** Lotus can make all its other products better, by combining and mixing the cc:Mail and Notes products with 1-2-3, Ami, Freelance and Agenda.

- **Instant opportunity.** Neither Novell nor Microsoft has the installed mass of e-mail end users that Lotus does. And, with Novell only just developing a much-evolved message handling service (MHS), and Microsoft still just talking about the Spitfire e-mail back end, Lotus is, in one sense, sitting pretty. If it adopts an aggressive development and marketing positioning. In the meanwhile, X.400 vendors have a small window.

Why Lotus Bought cc:Mail

Three messages coming to Lotus from the field over the past year contributed to the decision to buy cc:Mail:

Notes was a success, but was still too sophisticated for many end users. It stood a great chance of meeting and exceeding its budget plan for FY91, but still would not contribute more than a point or two to Lotus' top line.

Products like cc:Mail would probably dominate the bulk of electronic messaging for at least several years. Notes' natural customers were users whose needs had grown beyond electronic mail, and these customers were all owned by companies other than Lotus.

Lotus needed a low-end e-mail product. It would have to either partner with cc:Mail, develop a Notes "Lite," or purchase an e-mail product.

Lotus is on the verge of its first successful diversification. Its purchase of cc:Mail is less a tactical extension to the Notes sales effort than a product line in its own right. While the price was high (about 2-2.5 times 1990 revenues), it was probably right.

Challenges for Lotus

Despite the hype, cc:Mail, like other LAN-based e-mail players, is for groups of 20-25 users. Gradually, more and more end users are vested with an enterprisewide, or at least transdepartmental, role of implementing LAN applications such as messaging. These are Lotus's new customers. Through Notes and cc:Mail, Lotus can meet the needs of today's customers. To meet the needs of tomorrow's, Lotus should continue to develop or support sophisticated messaging technology necessary to create tomorrow's electronic messaging market. The ultimate success of the purchase will result from how well Lotus can respond to several strategic imperatives:

- Be at the forefront of solving the crippling problem of directory synchronization between disparate messaging systems.

- Partner with companies that can help solve large-scale messaging connectivity issues: DEC, Soft-Switch, Retix, Banyan and Novell.

- Fully exploit the technological synergy between cc:Mail and Notes. Integrate directory and naming services. Develop Notes' back end with cc:Mail's gateways. Enhance cc:Mail with some of Notes' sophistication.

Microsoft and Network Courier

While Lotus can claim the visionary, groupware high road with Notes and cc:Mail, Microsoft has hit the ground running. The result of this acquisition is every bit as strong as cc:Lotus. With Network Courier, Microsoft now controls 32% of the worldwide installed LAN-based messaging seats.

CSI has always been viewed as a technology-oriented company with well-engineered products, but somewhat lacking in marketing finesse and channel presence. Microsoft has had a major opening for just the technology CSI offers, and can provide CSI with unparalleled marketing muscle.

From CSI's perspective, the offer from Microsoft was probably the company's last best chance. Although it had performed admirably, garnering both market share and a reputation as a fine solver of LAN-based enterprisewide mail technology problems, $9 million CSI found itself in the not-too-desirable position of competing directly with $700 million Lotus on the standalone e-mail front.

In addition to this rock was the hard place of the emerging trend of client/server messaging. CSI had built its business on the backend messaging technology, of just the sort that network operating system vendors — Apple (System 7), Banyan (Vines/Streetalk), Novell (MHS/MMS) — are incorporating into their products. With NOS vendors providing these services, e-mail as CSI knew it — and built it — was being functionally devalued.

Challenges for Microsoft

Microsoft can distinguish itself thanks to the company's back-end network technology strengths (LAN Manager, and under development X.400 transport services and global naming services). It can also differentiate itself from Lotus via the potential integration with its front-end applications.

The real trick for Microsoft will be to provide integrated network technologies with workgroup applications while at the same time maintaining separation so that each product competes on its own. The company has surely displayed an uncanny ability to simultaneously furnish a level playing field for third parties (ISVs writing for Windows, for example), while still being able to leverage its position as owner of the field (Microsoft's own Windows apps).

The two acquisitions affect IBM and Novell as much as any companies. Are they now shopping for last-minute e-mail bargains? Maybe. Several things are for sure.

IBM will be quick to terminate its reference selling of Network Courier (which is the temporary DOS e-mail solution for potential OfficeVision sites dragging their heels en route to OS/2). Both IBM and Novell must take Microsoft's e-mail stance very seriously, if for no other reason than the acquisition of Network Courier puts Microsoft a step closer to Bill Gates's "information at your fingertips."

— with David Atlas

Computer Industry News ... Computer Industry News ... Computer Industry News

Amdahl announced support for ESA/390 facilities on its 5990 and 5995 series of processors and the 6100 storage processor. Lead times for the support are no longer than 12 months from when IBM will support the facilities on its thoroughbred ES/9000s. However, the real challenge to both Amdahl and HDS will come when IBM introduces Sysplex II. That will involve a software-driven implementation of system connection with shared global expanded storage. A complex software implementation creates a much bigger challenge for IBM in terms of development, but also for the PCMs to duplicate.

Cray Research introduced two new versions of its high-end Y-MP: a dual-chassis Y-MP8E and single-chassis Y-MP8I. The 8E can be configured with four to eight CPUs and up to 256 megawords of central memory in one chassis. The Y-8I comprises up to eight CPUs, and up to 128 megawords of central memory in a single chassis. Both are scheduled to begin shipping in June 1991. Cray claims improvements in price/performance, however, because Cray does not publish specific price information for individual system components, the breadth or validity of the price/performance claims are difficult to assess.

IBM introduced a trade-in program for 308X and 43XX customers toward the purchase of ES/9000 processors. It also applies to purchasing upgrades within the ES/9000 family.

Sequoia's next major announcement — the second generation of the Series 1000 (expected in 1993) — hinges on the success of the Series 400 XL, slated for mid-1992. The Series 400 XL will be positioned as a cooperative processor sharing data with mainframes. If it sells well into mainframe environments, Sequoia may go after the mainframe business more aggressively with second-generation Series 1000. Sequoia's OEM activity is continuing to ramp up, with at least one new OEM deal expected in the next three to four months. Sumitomo is the most likely Japanese candidate, being the parent company of JRIL, a local systems integrator, with whom Sequoia has partnered in the past. The company is also talking with Bull and Olivetti about potential OEM relationships. Sequoia and HP are in the last stages of a bid in Europe involving up to fourteen 1240s. In an effort to balance its distribution channels, Sequoia added 20 reps to its sales force last quarter.

Sayonara DIPS? Nippon Telegraph and Telephone may soon terminate sales of its own mainframe, Dendenshoka Information Processing System, which was launched in 1971. NEC has more to lose than Fujitsu and Hitachi, which jointly developed DIPS with NTT, because it has no IBM-compatible mainframes suitable for big upcoming telecom bids.

An initial ruling in the Apple v. HP and Microsoft copyright infringement suit was decided in Apple's favor. The court rejected the plaintiffs' argument that Apple's claims should be summarily dismissed because the visual elements of the Mac operating system were actually derivative works of Xerox, SmallTalk, and Star. But it in no way addressed the copyright infringement question. All will be back in court next month to determine a schedule for the resolution of the remaining issues.

A graceful exit? Intergraph announced that its mechanical CAD/CAE/CAM software will be available on a second hardware platform beyond its own: Sun workstations in early 1992. The move will expand Intergraph's universe of potential clients that were opposed to Intergraph's proprietary Clipper-based hardware. It also brings into question the long-term viability of the current Clipper line.

THE GRAY SHEET

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Computer Industry REPORT

D.B. McLEOD, EDITOR | APRIL 5, 1991 • VOL. 26, NO. 14 | *Published Continuously Since 1964.*

Another Fine Messe: 1991 European IT Markets and Hannover's Fair

Rapid 1990 growth in Europe was largely driven by the falling dollar; can the 13 countries comprising the world's largest regional computer market thrive in leaner economic times?

How important is Europe to worldwide computer vendors? Since many vendors sidestepped disastrous results last year because of booming European sales, the correct answer is: critical.

The 1990 boom was largely attributable to the strength of European currencies. Particularly in contrast to the dollar. Last year U.S.-based vendors rode slumping dollars and surging pounds, marks and francs to record European sales. The European computer market looked untypically bright.

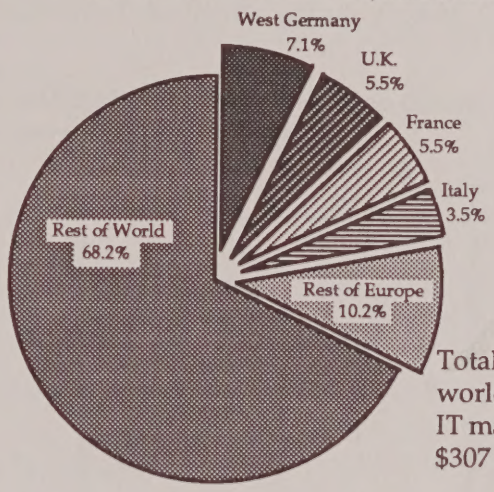
No more. Six months behind the U.S., Europe is mired in recession. The dollar actually climbed against major European currencies last quarter. That's why attention was so keenly focused on a small northern-Germany town for a week last month: the industry is looking for hard evidence that Europe in 1990 was no fluke. Some observations to put that analysis in perspective:

- **Europe is a critical part of the global computer market.** In 1985, the U.S. was half the worldwide computer market. Last year two-thirds of the worldwide computer market was non-U.S. And 57% of all non-U.S. hardware revenue in 1990 was earned in Europe.

- **Real 1990 growth in Europe only slightly outpaced U.S. growth.** In local currencies, the difference between growth of U.S. and European computer markets was tiny: 9% to 11%.

Selected European Proportions of 1990 Worldwide IT Spending

(Source: International Data Corporation, 1991)



Total 1990 worldwide IT market: $307 billion

- **U.S. companies *took* market share from European vendors in 1990.** European vendors are neither automatically nor inherently better-positioned than their worldwide competitors — indeed, often less so, when it comes to competing out of their national boundaries.

- **Europe is not united.** CeBIT is a German — not a European — show, dominated by German vendors and buyers. The 900 non-German vendors in 1986 grew to 1,700 this year. But the number of German vendors increased proportionally. In 1986, 64% of CeBIT exhibitors were German, this year 62% were.

- **But it attracts lots of worldwide interest.** Booths from Hong Kong and Taiwan dominated two major halls. In 1986, 62

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vendors from the Pacific Rim rented booths. This year, 495 did.

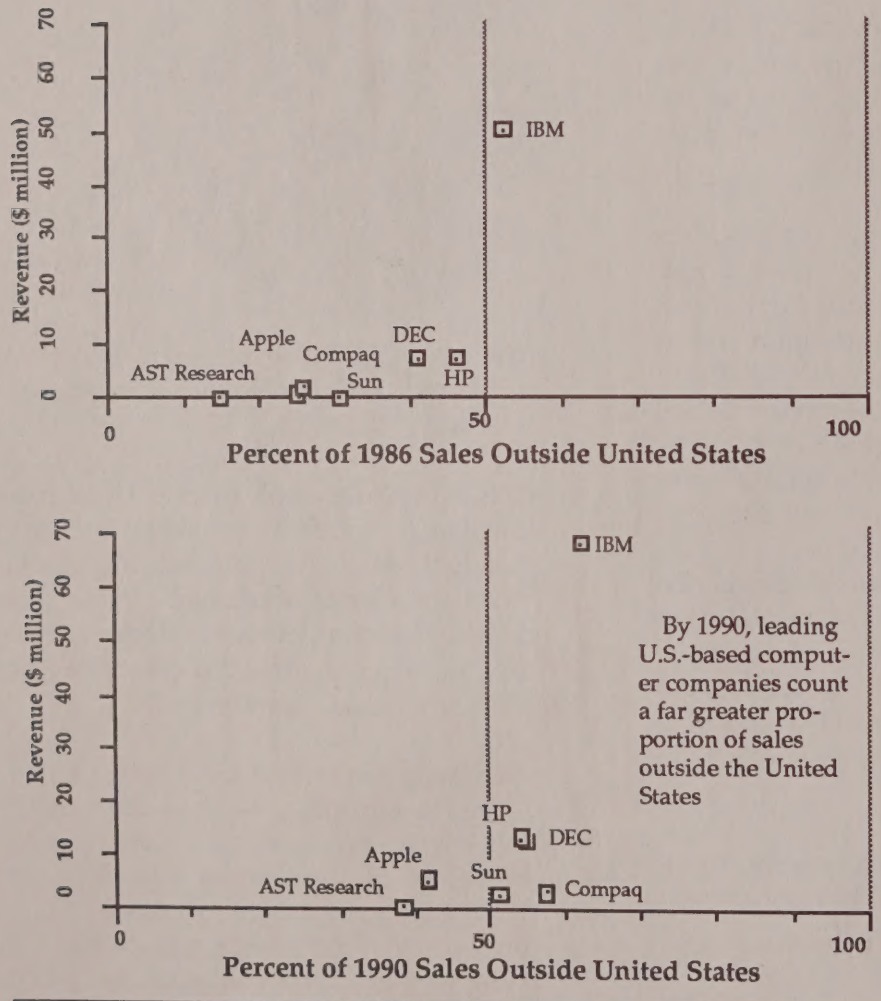
- **Asian markets continue to grow fastest.** If it's just pace you're after, look to the Pacific Rim. IDC expects those markets to grow almost twice as fast as U.S. and European markets over the next five years.

There is no European Computer Market. A handful of very strong, smallish, local markets — dominated by distinctive language and cultural barriers — are often oversimplistically referred to as "Europe." The similarities end there. And, as IBM just learned, he who builds his house on a foundation of sand will experience shaky quarters.

European Market Share Leaders (U.S.$)
(Source: International Data Corporation, 1991)

Country	#1	#2
Austria	IBM	Siemens
Belgium	IBM	Siemens
Denmark	IBM	Kommunedata
Finland	Nokia	IBM
France	IBM	Bull
Germany	IBM	Siemens
Italy	IBM	Olivetti
Netherlands	IBM	Digital
Norway	IBM	Norsk
Spain	IBM	Fujitsu
Sweden	IBM	Nokia
Switzerland	IBM	NCR
U.K.	IBM	ICL

Internationalization of Selected U.S. Computer Vendors
(Source: International Data Corporation, 1991)



That's not to say the outlook for individual countries in Europe is dismal. To the contrary. In the long term, Europe's outlook is somewhat brighter than that of the U.S.

While preliminary data indicates 1991 will show lower growth in Europe, that's because of the strengthening dollar. Europe remains a less saturated, larger market for computers, software and services than any other single region. But the unique characteristics of

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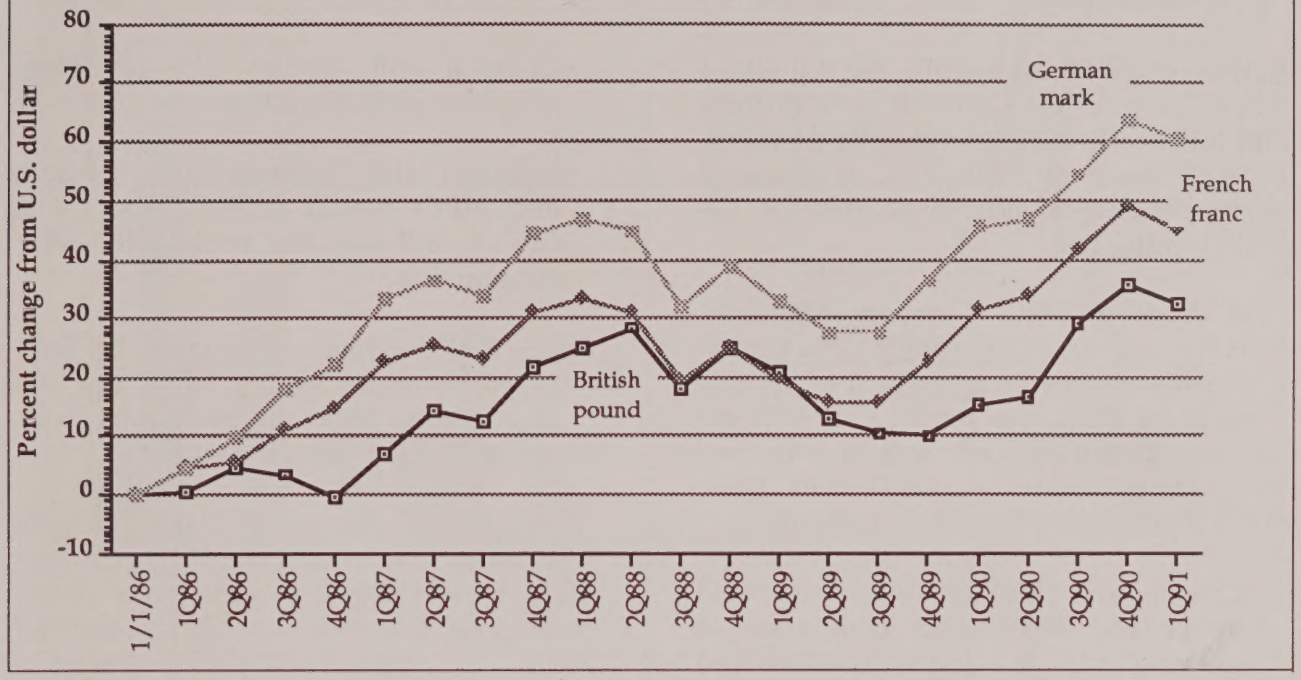
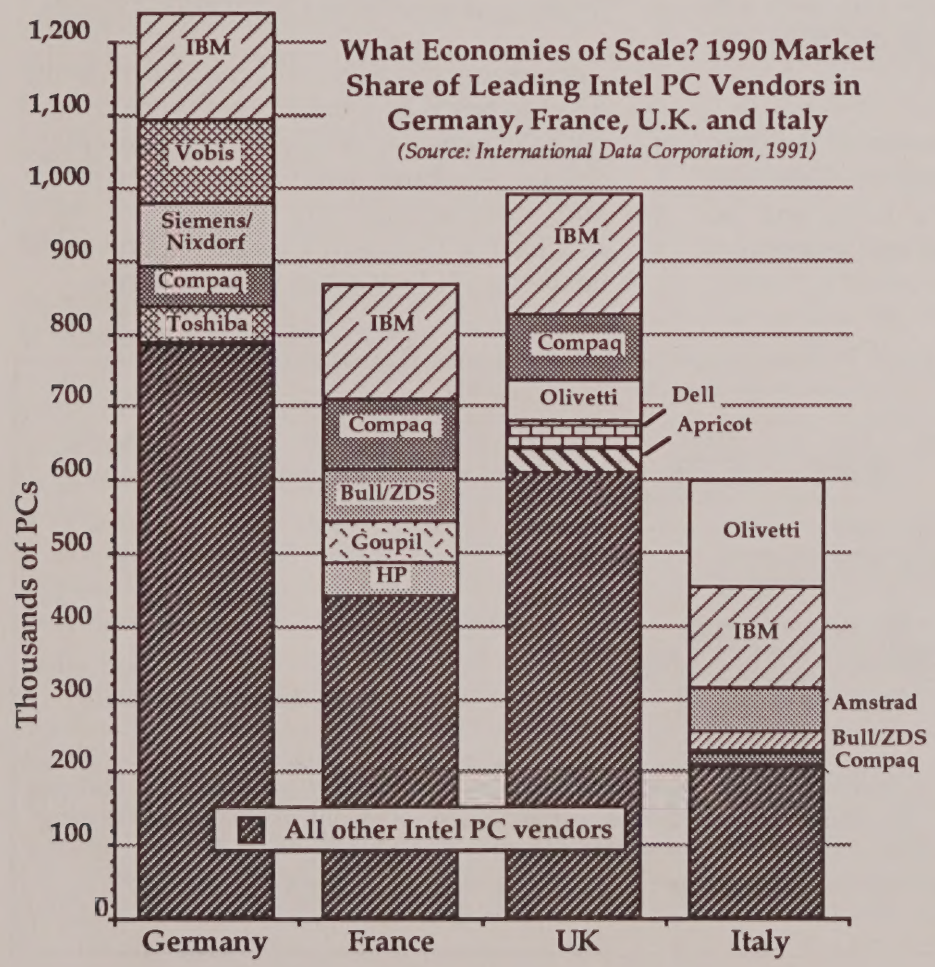
Western European Currency Changes Against U.S. Dollar, 1986 - 1991

(Source: International Data Corporation, 1991)



What Economies of Scale? 1990 Market Share of Leading Intel PC Vendors in Germany, France, U.K. and Italy

(Source: International Data Corporation, 1991)



individual countries prevent broad-brushed strategies from meeting with great success in Europe.

IBM holds more 1990 market share than any other single vendor, in almost every IDC system size classification, in almost every country. No European company — many of which dominate their local markets — has been able to establish a successful pan-European strategy.

IBM is the only vendor that is successful in every major European market. But it doesn't dominate everywhere. Olivetti sold more PCs than IBM in Italy last year, and Nokia'a sales were 25% higher in Finland than IBM's were.

Gibraltar: A Preemptive Sparc Strike (Even Without Hardware Until 1992)

Compaq, Digital, MIPS, and more gang up on Sun. At stake: the "open personal workstation" high ground

Sun may not be invincible. But it'll take a while. Despite 30%+ growth rates in units and revenue in 1990, and despite a projected 67% share of 1991 RISC workstation shipments, Sun is under siege from the "Gibraltar" initiative.

On April 9, DEC, Compaq, Microsoft, MIPS Computer, and the Santa Cruz Operation will announce an agreement to develop a standard hardware model that will encourage shrinkwrapped software in two RISC environments — OS/2 and Unix. Some highlights of the announcement:

- Compaq and DEC will promise to build compatible MIPS-based computers to compete in the low-end workstation and high-end PC marketplaces. The team will produce reference models in 2H91, and hardware 12 months later.
- There will be little commonality between Unix and OS/2 environments other than common hardware. The Unix will be DEC's OSF/1, packaged and integrated by SCO.
- Compaq will acquire 15% of Silicon Graphics for $135 million.
- Japanese MIPS licensees (including Sony and NEC) would prefer Unix V.4 to OSF/1, and may not support the reference models.
- OS/2 will remain dominated by Intel-based systems. Neither MIPS box will dramatically affect the traditional workstation market until at least 1993.

Compaq is effectively cloning Digital Equipment's workstation. Only Compaq plans to run OS/2. Digital gains certain prestige as a workstation standards-setter, and MIPS Computer's RISC chip gets a desperately needed binary compatibility story.

However, the team still has much to address in terms of what it takes to make competitive personal workstations (technology details — whose bus, whose 3D graphics), and, more importantly, how to sell them. Just having DEC and Compaq build similar hardware will not grant instant success.

Shrinkwrapped Workstation Software: Some Requirements

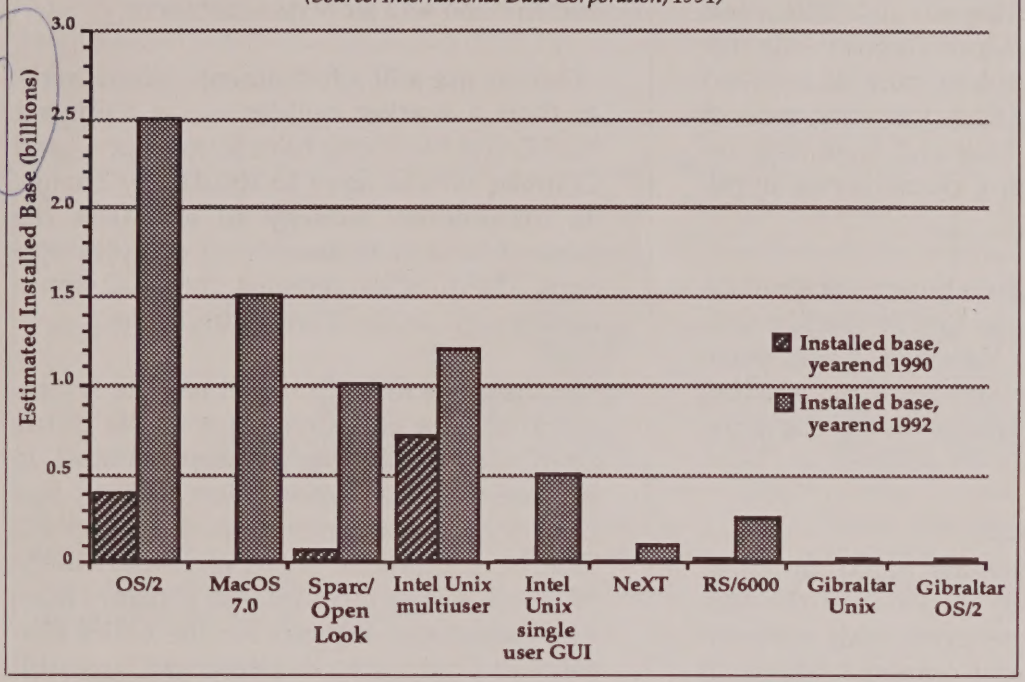
(Source: International Data Corporation, 1991)

	Sparc	RS/6000	HP	DEC	NeXT	Gibraltar	OS/2	Intel	Apple
GUI	Open Look	Motif	Motif; NewWave	Motif; DECwindows	NeXTstep	Motif; Windows	Windows	Motif	Mac
Graphics	own	SGI	own	PM; own	own	DEC; SGI	none		own
Networked Windowing	X; NeWS	X	X	X	Display Postscript	X; none	X	none	X
Networking*	ONC	DCE	DCE	DCE	own	DCE	?	OS/2	own
OS	SunOS; V4	AIX; OSF	HP-UX; OSF	Ultrix; OSF	Mach	OSF; OS/2	V3	OS/2	Mac; A/UX
Processor	Sparc	Power	HP-PA	MIPS	680X0	MIPS	386, 486	386, 486	680X0

This table highlights what IDC believes are the necessary ingredients for hardware platforms that can run shrinkwrapped software, and presents what various contenders for personal workstations are offering. Commonalities between Gibraltar and other workstation vendors are highlighted. The chart on the opposite page shows estimated installed bases of personal workstations at yearend 1990 and 1992.
(*All support TCP/IP, NFS)

Shrinkwrapped Workstation Software: the 1991 Scoreboard

(Source: International Data Corporation, 1991)



While an intriguing (to say the least) combination of bedfellows, the group will produce little other than marketing noise for the next few years. The group is already recruiting ISV support, and the announcement could distract commercial software developers from Sun Microsystems' Sparc.

Is Shrinkwrapped Workstation Software a Real Possibility?

From a technical software developer's point of view, one of the more promising aspects of Gibraltar is the overlap — in OS, windowing, and networking — between major workstation suppliers IBM, Hewlett-Packard, DEC, and Gibraltar Unix. There appears to be more in common there than between Gibraltar Unix and Gibraltar OS/2.

Compaq's investment in SGI and Microsoft's announcement that it will license SGI's 3D graphics library will cement SGI's influence in that camp. DEC has its own competitive strategy for 3D graphics, and if the camps diverge, it might make even the Unix boxes incompatible from a shrink-wrapped software point of view.

However, there won't be enough systems shipped in the near term (developers usually key on 50,000 units/year) to attract a great deal of ISV attention. So while Gibraltar assembles the pieces for a porting base for shrink wrapped applications, that's at least two years off.

What Members Do Get from Gibraltar

In the meantime, each member of the coalition can get a good deal of marketing mileage from the announcment:

Compaq needs to develop high-end, high-margin products and help its dealer channel evolve to the point where it can sell them. A RISC system that runs OS/2, Novell, and Unix fits its current business model and acts as a defense against workstation incursions on its technical PC market.

DEC gets another shot at the commercial desktop with a box that it can also position at the low end of its workstation line. More importantly, it gets the chance to spread its software and networking expertise and tools with Microsoft and Compaq.

Microsoft can take a shot at Sparc/Unix's threat in its home markets, and gain scalability and "open-ness" for OS/2. It could eventually design applications for Gibraltar Unix, but will emphasize OS/2.

The **Santa Cruz Operation** preserves its relationship with Compaq and DEC, and may be able to grow Open Desktop into this space. It will not be able to milk its installed base of multiuser VARs or software, most of whom will stick to Intel and have little interest or skill in selling client/server applications.

MIPS Computer gets a binary compatibility story, and it may be first to market with Gibraltar hardware. However, it will alienate licensees who favor Unix V.4, including Tandem, Pyramid, and probably the Japanese.

Gibraltar's Agenda

The success of systems based on these platforms will largely depend on the success and depth of the partnership between Microsoft, DEC, and Compaq. Microsoft can sell to and support applications companies; DEC can sell and support complex systems; Compaq can compete against IBM in desktops sold through dealers. But will these skills be exchanged or mingled? The partnership is new, and its members have somewhat conflicting agendas, so we are skeptical until we have reason to believe otherwise.

Since Microsoft has lately left OS/2 market development to IBM, and IBM will have no interest in Gibraltar, OS/2 will remain an Intel 386 and 486 market. The coalition has much work to do to incorporate LAN Manager and Novell into Gibraltar's scope, and that too will slow its acceptance.

Dealers are still a fulfillment channel rather than a market builder — as Compaq, NeXT, and Netframe have found out — and Compaq would have to drastically change its distribution strategy to stimulate the sales of tens of thousands of complex systems. The question remains, can DEC stimulate enough demand with direct sales?

In the short term, Sun will have to scramble to answer the threat of a viable future distributed-computing desktop standard. In its core technical workstation market, Sun faces more of a threat from IBM and HP than from Gibraltar. However, Sun's ONC/NFS technology faces intense pressure from the widespread support for the OSF's Distributed Computing Environment, now aided by Compaq's endorsement. And second-tier PC companies who might have been considering Sparc or Intel RISC will probably follow Compaq as they did EISA, with aggressive technology providers like AST and ALR leading the way.

Gibraltar is too far behind the major workstation platforms to compete for all but the lowest end of that market, though it will benefit from common technologies. As a next-generation commercial desktop, it will some day steal thunder, and probably market share, from Sparc and Intel Unix.

— With David Card

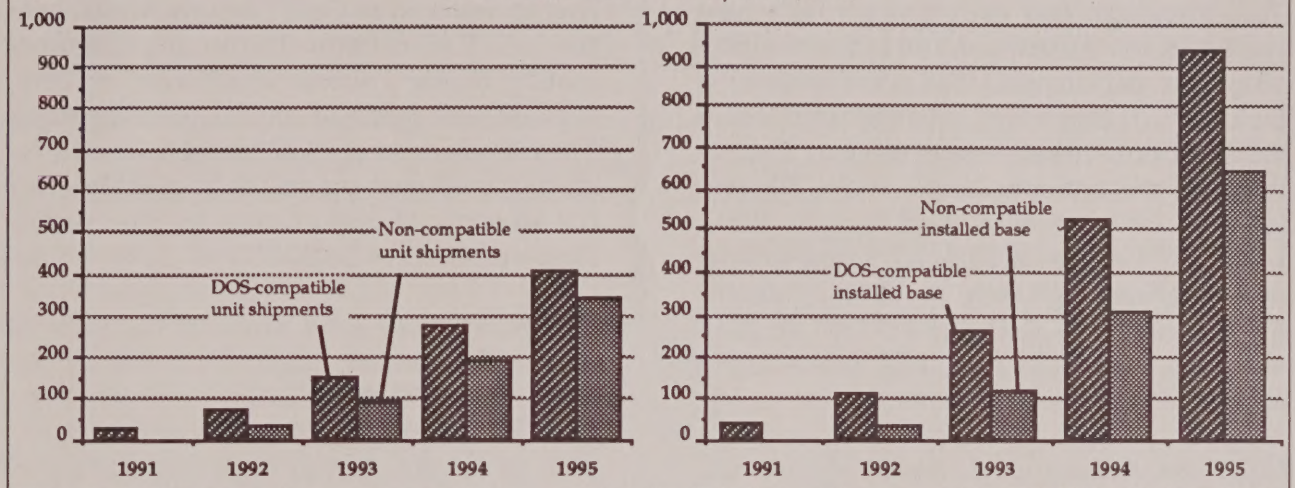
How Far, and How Fast, Will Pen-Based Computers Go?

Pen-based computers such as prototypes based on Go Corp.'s PenPoint operating system are following a familiar lead: highly targeted vertical applications driving pen-based computers into a broad-based horizontal market (see *CIR* 26:4, October 19, 1990). Thus, according to some, we will all soon be carrying pen-based portables and scribbling notes during lectures, at stoplights, and in bread queues into our portable electro-notepad.

That's still way off. IDC expects that by 1995 the total installed base of all types of pen-based computers will reach only 1.5 million units. Much uncertainty surrounds

Pen-Based Computer U.S. Operating System Shipments, 1991-1995

(Source: International Data Corporation, 1991)



Data includes operating systems sold on: notebooks (7.5 lbs. or less, roughly 8.5x11"), filofax-sized units (7.5"x9.5"), vertical-market devices (handhelds), electronic organizer devices (palmtops) as well as larger coat-pocket units. These forecasts are excerpted from IDC's analysis of the pen-based computer market, bulletin #5447, March 1991.

the nascent markets:

- **System software**. Go and Microsoft are funding dueling R&D efforts to design and write pen-based system software. While Go has the technological headstart, Microsoft has the momentum of Windows. When the c-word (compatibility) comes up, it's difficult to underestimate the effect of good marketing. Penwindows will certainly be compatible with the DOS world, and more. Go's Penpoint will have file compatibility only.

- **Vertical applications**. So far only deliverymen, inventory controllers and field service personnel seem to have any real need for pen-based computers. Soon we will see potential applications in lots of other niches: nursing, field sales personnel, anyone on-the-go with the need to compute.

- **Or, horizontal**. Perhaps of more interest is the broader appeal of pen-based computers: when, if ever, word processing, spreadsheet and database applications become realistically viable on pen-based platforms. And that's a long way off. The real question is: when they do, will administrative assistants and clerical workers prefer (i.e., be more productive using) pens to keyboards?

- **Hardware questions**. To date, little pen-based hardware has been shipped. Grid has shipped 10,000 of its 8086 systems, attracting 280 software developers. Go has a prototype which it provides to OEM partners. IBM will probably release a pen-based product in 1992, and NCR has developed an 80386SL-based pen system due for beta testing next month. Four others, Scenario, Inc. (U.S.), Kyocera (Japan), Eden Group and Active Book (U.K.), have announced pen computer plans.

IDC expects demand for pen-based computers will evolve slowly. Microsoft's Pen-Windows and GO's PenPoint will coexist, and portability to DOS platforms will eventually open a universe of applications. In the near term, a lack of applications will mute demand for 18-24 months.

— With Nancy McSharry and Bruce Stephen

Computer Industry News ... Computer Industry News ... Computer Industry News

How tough is workstation competition? Tough enough that even though HP's new workstations outperform the industry's previous top performers (IBM's RS/6000) by a factor of 2-1, they won't save HP from losing workstation market share this year. The net effect of the announcement of the 50- and 60MHz, HP Precision Architecture RISC, Model 700s will be to slow HP's year-to-year unit shipment growth to 19% (industry growth is 46%). IDC expects HP to ship about 20,000 Model 700s, and about 70,000 Motorola-based workstations.

IBM: bellwether/provocateur? As we last went to press, IBM announced flat year-to-year revenue, and much lower quarterly profits. The Dow responded by dropping 60 points. IBM reported softness in all segments, except RS/6000, and pointed to slower European sales. The transition to S/390, and the need for a PC product line upgrade outweighed what is, by most accounts, continued strength in the midrange. Maybe IBM's just onto something faster than other vendors, because of its ultra-fast internal communications and reporting structure. Maybe Europe in 1990 really was just a currency phenomenon (i.e., see p. 1!). Especially for the AS/400. Any way you look at it, IBM is paring down: 4,000 employees of the now-sold typewriter division, and 10,000 others, mostly in the U.S.

Hewlett-Packard's recently created Cooperative Computing Group has been dismantled; PCs and PC networking products are now in one group while all distributed computing products report to the workstation and multiuser systems group.

IBM portable announcements. IBM introduced an 80386-based notebook in Japan that runs DOS J4.0/V, which displays kanji characters in VGA mode. The PS/55note was developed by IBM Japan for the Japanese market; it will not be available as a general-purpose notebook. IBM's laptop L40SX, first announced at CeBIT is now available in the U.S. IDC expects IBM to ship approximately 80,000 L40SXs worldwide in 1991, with 50-55% going to international markets. The introduction of 386SL notebooks and declining notebook prices could quickly close the window of opportunity for the moderately-competitive L40SX.

Computer Associates dropped the price of Supercalc5, which holds about 8% of the worldwide PC spreadsheet market, from $495 to $149. **Apple** lowered prices up to 30% on its medium to high-end Macs, and **Amdahl** announced its own version of AD/Cycle, Huron, which would be a lot funnier were it not for Fujitsu's looming bulk putting significant weight behind the announcement.

What's NeXT? Fully one-half of NeXT's Q1 shipments were upgrades from the old 68030 boxes to 68040s. So what? NeXT counted the upgrades as shipments when comparing NeXT's Q1'91 sales to other commercial workstation vendors' Q4'90 sales. But their upgrades weren't counted. Tsk, tsk.

Data General's new quadprocessor 88K-based Aviion, running Unix V.4 and coupled with disk arrays, boosts the top end of its Unix line into the database engine space. But it's unlikely DG can do enough market development to increase the commercial medium-scale Unix systems market's growth rate above 15%. The company has significant challenges: Intel Unix, HP, IBM and Sun (in various orders, depending on market) are at the top of ISV's lists of porting bases. And DG's "we're a billion-dollar company, we've made Unix commercial" message won't work against HP or the proprietary lines of IBM and DEC. Nonetheless, DG's price/performance may make HP, DEC or IBM — companies that can make markets — sit up and take notice.

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D.B. McLEOD, EDITOR APRIL 26, 1991 • VOL. 26, NO. 15 *Published Continuously Since 1964.*

The Beginning of the End of Microsoft's Desktop OS Dominance? Naaah.

IBM blew it by leaving OS/2 market development to Microsoft in 1987; with the release of version 2.0 by yearend, it is working hard to avoid making the same mistake

What are prospects like for the all-IBM 32-bit OS/2 2.0 now promised for the fourth-quarter? Trapped between 16-bit DOS and portable OS/2 3.0, it has suffered from technical development problems, horribly imprecise marketing, and customer apathy. IDC estimates only 3% of PCs in the U.S. were shipped with OS/2 last year, with an even smaller total outside the United States.

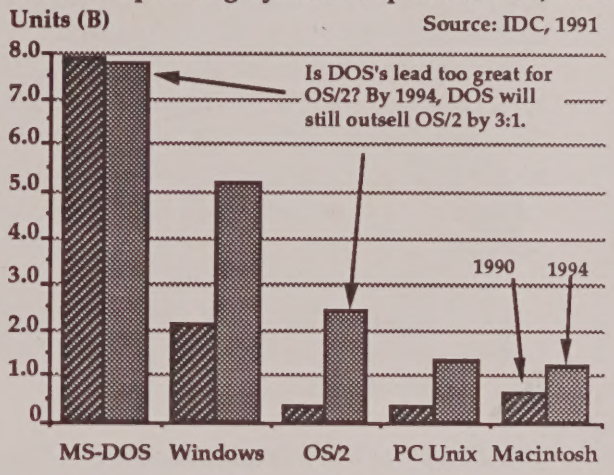
IBM is working hard to change that. Having wrested complete control of OS/2 2.0 from Microsoft (which retained control of portable 0S/2 3.0) last fall, IBM is taking steps to ensure that OS/2 2.0 is no longer the laughingstock of the desktop operating system (OS) business. It is talking up an aggressively priced OS/2 with "DOS better than DOS, and Windows better than Windows."

It's not that simple. Big surprise — success in desktop market segments does not necessarily go to the most technically sound product. Market development is everything. Installed base is next. And perceived momentum is probably equally as important. The upcoming intense competition will center around these facts:

OS Market Conditions

- **OS market development.** By largely leaving OS/2 1.1 and 1.3 market development to Microsoft, IBM made the huge error of assuming that fundamental PC OS market conditions had not appreciably changed since 1981. They have. The single most important criterion for selling OS is application support. Then, expediting custom internal MIS development efforts. Market development is the act of getting ISVs and shrinkwrapped application developers working on your system. IBM, with a little more to spend than Microsoft, should do a better job, despite the fact that OS/2 development efforts might divert resources from Windows applications development.

U.S. PC Operating System Shipments 1990, 1994e



- **Competition *and* collaboration?** Cross-licensing questions dominate the IBM/Microsoft collaboration. Will IBM sell 3.0? Microsoft 2.0? They *can*, according to the contract. But can competitors *really* collaborate on products that constitute such a major part of each company's overall strategy? May be. Particularly when Apple is expected to announce 32-bit System

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IDC INTERNATIONAL DATA CORPORATION
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7 on May 13. A common enemy might make IBM flexible enough to allow Microsoft to write 32-bit Windows right onto OS/2. Unless, that is, IBM feels like hedging its Microsoft bet by aligning with Apple.

- **The animosity factor.** Microsoft better be careful. More than one application developer — not to mention the FTC — is getting extremely wary of Microsoft's OS-applications cross-subsidization strategy. As expressed by the CEO of one application developer: "Bill Gates is bright, but so are a lot of people. No one trusts him anymore." Nonetheless, market reality still ranks more important than personality: applications developers initially on the Presentation Manager bandwagon — Lotus and Software Publishing, most notably — dramatically jumped ship.

- **OS/2 has backwards momentum.** Selling DOS was easy. That meant selling IBM. Customers just trusted IBM's choice of Microsoft. But the early versions of OS/2 were different. There was Standard Edition, Extended Edition, LAN Manager, Presentation Manager. More than just a single DOS. As a result, OS/2 has built considerable negative momentum that IBM must overcome.

- **Unix is gaining.** Unix has gained commercial-market credibility in part as a result of OS/2's troubles. OS/2 will now go head-to-head with Unix for the commercial high-end. It may not punch through the Unix firewall.

- **Windows has powerful momentum.** Despite its shortcomings as a next generation platform, Windows is still going like gangbusters. Over 2.1 million Windows units shipped in the U.S. alone last year.

Technology Factors

- **The hardware platform's in place.** Over half of all domestic PC shipments in 1991 can run a true 32-bit OS like OS/2 without performance penalty. OS/2 is IBM's client OS of choice.

- **32-bit performance.** Windows on DOS, no matter what you hear, is still 16-bit technology. IBM has a window of opportunity to exploit: cheap RAM and disk will help IBM until 32-bit Windows is ready.

- **Security.** IBM promises that OS/2 will mean the end of PC lock-up. You know, an application crashes and the keyboard locks? Industrial-strength distributed applications begin with secure clients.

- **Multitasking.** The ability to run several applications concurrently, without system degradation, boosts client productivity immensely. It, too, is a building block for true distributed applications.

IDC expects that 1991 will be the last year DOS will show worldwide unit growth. Next year starts DOS's real decline. The question dominating the desktop: how quickly will the decline proceed?

The answer lies in how quickly OSF Unix, UI Unix, Apple System 7, IBM OS/2 or Microsoft portable OS/2 can emerge to drive the next phase of growth. Since the success of OS/2 2.0 is critical to IBM, but not to Microsoft, Microsoft's OS/2 3.0 might be the early favorite. But no one has more OS market development skill than IBM. Its OS/2

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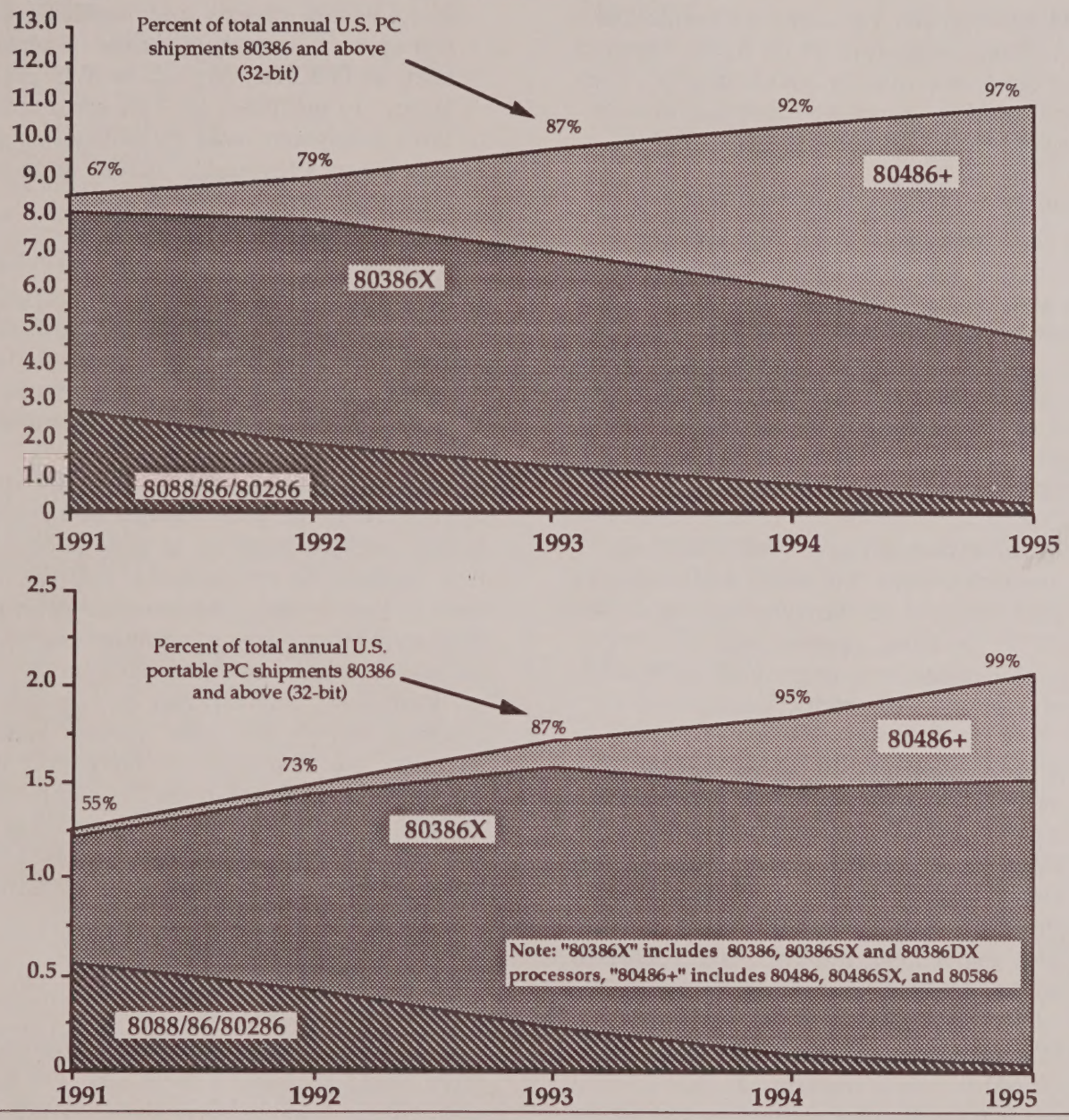
Shipments of 32-bit PCs on the Rise: All U.S. Intel Desktop and Portable PCs, by Processor Group

(Source: International Data Corporation, 1991)



may be just the right combination of features and timing to fill the void.

But Microsoft still has incentive to work out its difficulties with IBM. Being on IBM's bad side in Fortune 500 MIS accounts could bring its momentum to a screeching halt. It's still not too late to save the relationship. Call it the Apple Compact. Business should, and shall, prevail over personalities.

If it doesn't, don't be surprised to see IBM start shopping around for another OS alliance. IBM already licenses NeXTstep. Its safest choice may be to license Apple's GUI, and leave Microsoft to worry about ACE and portable OS/2.

— With Ben Rose (TISC) and Nancy McSharry

IBM Revamps AS/400 Family and Strategy

IBM has had two missions for the AS/400: to facilitate migration of its S/3X installed base (and, importantly, its channel partnerships) and to penetrate untapped markets. It is succeeding on both counts.

But the midrange market is hardly standing still (see *CIR* 25:21-21, 26:9-10). The AS/400 is not well positioned against existing file and print server units, and is losing the client/server marketing war. For example, 9406 sales slowed considerably last year, especially overseas. To maintain momentum, IBM needs to modify its AS/400 strategy. Some highlights of this week's AS/400 announcement:

- **Introduction of the AS/400 D models**: 11 machines, from the 9402 D4 (1.5 relative performance) to the two-way 9406 D80 (19.8 relative performance). Price/performance was improved by 35-53%, on a product-to-product basis.

- **A new high-end** — the dual-processor 9406 D80 — offering 2.7 times the performance of the current B70. The D80 supports up to 384MB memory, and 124GB DASD, and sports the combination of a standard battery backup and internal disk that enable the large main store to be dumped with minimal loss of data.

- **OS/400 enhancements.** OS/400 2.1 is required for all D models; OS/400 1.3 will not run on the new units. IBM has established financial incentives to convince customers to "skip" OS/400 1.3.

- **Communication (ISDN) options.** The AS/400 now supports data transmissions using the ISDN basic rate interface.

- **The opening of OS/400.** APIs were added for processing alerts, accessing document library objects and handling vendor-specific communications protocols, such as DECNet, Novell, or X.25 packet layer. In addition, an OSI communications subsystem was introduced to service layers 3 through 6 as well as to provide X.500 directory service.

- **Tighter PC support** was introduced through enhancements to PC support/400. The system administration function was enhanced to include central point control for workstation configuration as well as downloading user applications.

Stung by Q1 losses, IBM is in a particularly aggressive mood. The Model D series puts it in an excellent position to vent its frustration against its competitors. For the first time in over a year, IBM has clear price performance advantages to complement its applications (9000+) and service (quality) story. Both DEC and HP can be expected to respond within the next several weeks/months. The customer should expect new pricing and products from the competition as well as higher levels of discounting. In the meantime, the AS/400 — the last of the great proprietary product lines — is alive and well.

The AS/400 Is Client/Server

IBM's AS/400 strategies and technologies have been significantly reworked. The high-end 9406 D models boost performance and improve upgradability. The first multiprocessor unit, the two-way D80, extends the family's performance range 18-fold. IBM has begun an aggressive market share assault on the midrange, with particular emphasis on the client/server market.

As expected, the AS/400 has emerged as IBM's midrange workhorse. Although pre-

TPC-A Benchmark Results for AS/400 and Competitive Systems

(Source: International Data Corporation, 1991)

Proprietary

SYSTEM	TPS	K$/TPS
DEC VAX 4000-200 +2 MicroVAX 3100s	13.1	31.1
DEC VAX 4000-300 +3 MicroVAX 3100s	21.6	28.3
DEC VAX 6000-510 +5 MicroVAX 3100s	32.5	35.9
AS/400 D10	6.5	18.3
AS/400 D35	10.0	19.0
AS/400 D60	32.0	21.3
AS/400 D70	42.5	22.1
AS/400 D80 (Est.)	61.0	
HP 3000 922	7.7	28.8
HP 3000 932	13.6	28.8
HP 3000 948	38.4	19.9
HP 3000 949	32.2	26.9
UNISYS MA825DS	7.96	21.6
UNISYS MA825FS	11.95	22.4
UNISYS A6FS	15.89	32.0
UNISYS A6HS	26.29	30.5

RISC and Unix

SYSTEM	TPS	K$/TPS
AS/400 D10	6.5	18.3
AS/400 D35	10.0	19.0
AS/400 D60	32.0	21.3
AS/400 D70	42.5	22.1
HP 9000 842S	33.0	25.5
HP 9000 852S	43.3	24.1
RS/6000 520	17.0	19.2
RS/6000 530	20.8	20.2
RS/6000 540	24.5	20.5
RS/6000 550	32.0	19.2
UNISYS U6000/55	7.9	21.6

IBM performs well against its major competitors on the TPC-A benchmark, even the HP 3000 series. HP differentiates the HP 3000 from the HP 9000 based on the 3000's prowess in OLTP applications. HP is generally regarded as a midrange OLTP leader among major vendors. The real test for the AS/400 comes in comparisons against RISC-based Unix platforms.

viously expensive from a price/performance standpoint, IBM's success in integrating critical hardware, software, and communications technologies, and linking them with the market's leadership marketing and distribution systems, has enabled consistent double-digit worldwide AS/400 revenue growth.

IBM is preparing a major market development campaign to sell the concept of "enterprise wide" client/server computing. While we note that IBM's AS/400 multiples marketing campaign is generating significant returns, in the near term the market will be skeptical of this initiative. Nonetheless, IBM will have significant influence in the evolving client/server market.

IDC believes that the new "D" models nearly triple the previous high-end performance. Additionally, the new machines offer enhanced upgrade potential by exploiting the "book" packaging technologies previously found only in the 9404 models.

The AS/400 Is Competitive

IBM recognizes that success of the AS/400 draws heavily on three things: its business partners, availability of applications, and perceptions of quality. IBM also recognizes that it can not be far off the price performance curve. Feeling competitive pressures, IBM has taken an extremely aggressive pricing posture. This coupled with marginally higher than expected performance numbers has resulted in a very competitive product.

The AS/400 stands up quite well against some of the well-known RISC-based servers. Many of these servers are in the middle of their product cycle and are due for a price/performance kicker. Still, the fact that the AS/400 puts in a favorable showing is indicative of IBM's current aggressiveness in the commercial midrange market.

— With Peter Burris and Bill Sines (TISC)

Midrange Slump Bottoms Out: 1991 Outlook

The midrange slump bottomed out last year. IDC expects small- and medium-scale markets to grow 4% to $50.3 billion in 1991. Three dominant trends will drive growth:

- **Small systems, and Japanese vendors.**
- **The Big Three:** IBM, HP product cycles strong; DEC weaker.
- **Newer architectures,** featuring RISC, Intel, and multiprocessing.

Since most suppliers can't crack the Japanese market, they will concentrate on small systems using newer architectures, and ride the Intel, RISC, and multiprocessing waves. Two factors will determine 1991 success: time to market with complete product lines, and market development in servers.

IDC expects midrange growth to pick up somewhat in 1991, growing 4% worldwide to $50.3 billion, with small-scale (under $100K) systems leading the way. Continued strength in newer small systems and servers will fuel growth in U.S. and European markets, while Japanese suppliers will continue strong in their domestic market.

The two-year U.S. midrange contraction appears complete, and we expect an upturn in 1991, with growth strongest in the second half. We expect U.S. midrange sales to grow about 1%, with small systems at 5% and medium systems shrinking 3%.

European markets had been slower to contract than the U.S., but now the U.K. is leading a European midrange slowdown. Nonetheless, market growth, at 4%, will outpace that of the United States. The dollar has strengthened recently versus other currencies, which, if it continues, will make U.S. products more expensive and European results less impressive when reported in dollars. Still, major restructuring efforts by nearly all of the European midrange companies should weaken them in competitive situations versus U.S. multinationals.

The Japanese commercial market remains largely unavailable to U.S. or European products, with workstation servers, high-end AS/400s, and Unisys 2200s the rare exceptions. Japanese midrange sales will grow in the 8-10% range.

The Big Three

IBM's weak Q1 and flat 1991 revenue projections reflect mainframe and high-end DASD issues more than its midrange. The AS/400 introduction (see p. 4) will double current high-end performance (and increase prices accordingly) and should take advantage of rich AS/400 budgets. The bigger systems may pull through more sales of multiples as well, probably more in the U.S. than other markets. Air-cooled 390s will continue to steal mainframe business, as customers replace 4381s and migrate down from larger models. The RS/6000 will again be strong in small-scale Unix hardware, and will not harm AS/400 business — or IBM midrange margins — in 1991.

Digital Equipment's midrange is more vulnerable than IBM's in the near term. DEC's midrange VAX mix is "midsizing," that is, the 6000 downsized 8000 business while the 4000 moved MicroVAX business upscale. However, DEC's medium-scale business is deteriorating and forcing continued margin pressure overall. A renewed fault-tolerant line will help, but we expect that a 20VUP model 4000 (250% performance increase for 30% price increase) in the summertime will continue to hurt the bigger VAXs. DEC's RISC Unix line will get a boost in the $50K-100K price range in the late summer or early fall, but will remain weak at the top end until new multiprocessing arrives in 1H92.

Hewlett-Packard's product line is largely set for 1991. It is a strong one. HP will plug 50- and 66MHz CMOS chips into the mid-

dle and low end of both its Unix and MPE lines within a quarter or two, and add a high-end kicker at yearend. HP will concentrate on partnerships, a la Computer Associates, and looks strong for '91. MPE sales are slowing somewhat, but Unix continues to grow at high double-digit rates.

Hot Architectures

IDC's recent U.S. buying intentions survey showed intense interest in servers, but with a bias toward low-end Intel-based systems — PCs running Novell. Midrange VMS and Unix sites showed more positive reactions to client/server computing (although IBM mainframe sites were the most positive), indicating that the bulk of proprietary mini users will require more missionary selling.

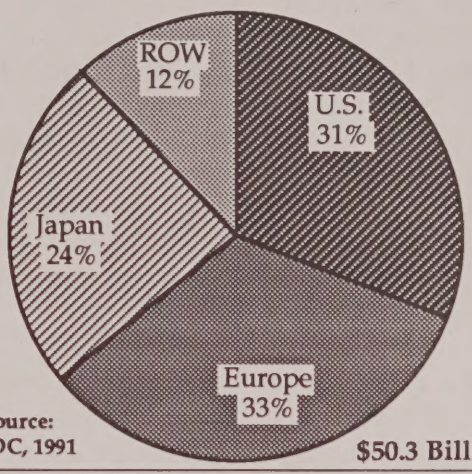
Not surprisingly, sites where AS/400s are the senior system are quite resistant to client/server hype, and are also the least interested in Unix-based open systems strategies. Seven percent said they were actively pursuing Unix strategies, compared to 20% of IBM 370 sites and 27-28% of other mainframe and mini sites.

Server interest is heightening, and two related 1990 microprocessor-oriented movements bear watching: (1) Intel-based systems (both multiprocessing and PC-like) and (2) RISC-based, server-style systems.

Shipments of PCs configured as commercial multiuser systems running Unix reached about 100,000 in the U.S. in 1990 — three quarters the number of small-scale systems. At the same time, multiprocessor Intel systems accounted for just under 3% of U.S. small-scale shipments. RISC-based small system shipments made up under 15% of the U.S. total, for about 13% of the value of shipments. Each will grow above the industry average in 1991.

Savvy suppliers will ride the software and channel waves of these two movements. Intel systems can play in both the Unix and

1991 Midrange Systems Market by Region of Consumption



Source: IDC, 1991

$50.3 Billion

Novell worlds ($200 million worth of 1990 Systempros for Compaq) and can be sold effectively by VARs. Within the next year or so retailers will play a larger role.

RISC systems offer perceived performance benefits (though that really comes down to system design) over Intel but less in the way of common software. Sun, HP, and IBM drove RISC volumes, and only Sun's Sparc is licensable. Hardware companies who can afford to sell either RISC or Intel-based multiuser systems and servers will enjoy volume business over the course of the next year and a half.

One more systems architecture is attractive — high availability hardware and software may be the salvation of some proprietary lines. But with disk arrays and other storage features becoming available for Unix and even Novell systems, proprietary suppliers will have to scramble to keep ahead. Moving high-availability features down from medium- to small-scale systems should generate new and add-on business.

Hardware companies hoping to rely on the Three-S Cliche — software, solutions, and support — are facing long-term payoffs, if any. Efforts for the next 12-18 months should be focused on getting networking and Intel or RISC hardware to market

Continued next page

4th Front
Donald Bellomy
Qty: 1 G,A,J

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Digital announced two extensions to the DECstation 5000 family — the first ACE-compatible workstations. Even though they do not compete effectively against the raw performance of the IBM RS/6000 and the HP Series 700, they fill out Digital's mid-range RISC wortkstation line. Entry cost and price/performance are more critical than raw performance anyway. Does ACE just mean DEC-clone?

The EC Commission asked Paris to explain the $1.05 billion in aid given to Groupe Bull and Thomson. The commission approved the merger of French-based Alcatel with Teleterra, the telecommunication's subsidiary of Italian automobile manufacturer Fiat.

Top 20 worldwide IT vendors' 1990 results:

	IT Revenue $B	Annual Change	Corp. Profit$B	Annual Change
IBM	69.0	10%	6.0	60%
Digital	13.1	1%	-0.1	NA
Fujitsu	11.7	12%	0.6	19%
Unisys	10.1	0%	-0.4	NA
NEC	9.9	10%	0.4	-20%
HP	9.5	12%	0.8	-5%
Hitachi	8.2	10%	0.9	9%
Smns./Nix.	8.0	-.6%	NA	NA
Bull	6.4	6%	-1.3	NA
NCR	6.3	6%	0.4	-10%
EDS	6.1	12%	0.5	14%
Apple	5.7	7%	0.5	14%
Olivetti	5.7	0%	0.1	-70%
Toshiba	4.1	17%	0.7	3%
Compaq	3.6	25%	0.5	36%
Canon	2.8	34%	0.2	43%
Sun	2.8	34%	0.2	318%
Seagate	2.7	48%	0.1	-5%
NTT Data	2.4	13%	0.1	-4%
Wang	2.4	-13%	-0.7	NA

Source: IDC, company reports, 1991.

Notes: Annual Change reported in local currencies. All profits at corporate level often include non-I.T. elements. Siemens/Nixdorf comparisons to combined spearate companies; 1990 losses not available. Bull includes ZDS in 1990 but not 1989.

Notable financials: Sun brighter than ever. Sun shipped a total of 44,000 units during the quarter (IDC estimates 18,000 of those were Sparcstation IIs) and announced record quarterly revenue and profit. **Data General** turned $19M profit and finalized the sale of its Japanese subsidiary to Omron for $46 million.

SystemView clearer. IBM filled some, but not all, gaps in its high-end system management strategy — announced at the same time as S/390. SystemView — IBM's blueprint for managing heterogeneous computing environments — still remains more promise than product.

1991 Midrange Outlook, cont.

quickly and firming up distribution channels at the low end.

Catalysts for Change

Two things could upset the near-term midrange market: mergers and currency.

Any merger can affect a company's or market's performance. The biggest one looming is AT&T's takeover of NCR. Both companies believe in basically the same strategies, so this merger would be easier than some, but still has the potential to slow both companies' product transitions and render them vulnerable. Wang and Data General are other potential takeover targets.

If the dollar continues to strengthen against European and Asian currencies, U.S. companies' performance could be affected. Though most employ currency hedging strategies, negating some effects of currency fluctuation, a dramatic rise in the dollar would make U.S.-built products more expensive in foreign markets. This could impel some Europeans with U.S. OEM deals (Philips, Siemens) to reemphasize home-built goods or turn to Far Eastern suppliers.

— With David Card

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PC Leaders' Price Cuts Highlight Intense Competition

With PC growth slowing, Apple, Compaq and IBM are all fighting for maket share by competing on price; when does the strategy start taking its toll on PC middlemen?

Are PC price cuts an offensive or defensive weapon? Certainly Apple has taken the offense. It shipped 85% more Macintoshes during the first quarter of 1991 than Q1 1990, thanks to September price cuts and the introduction of new low-cost Macs. What's more, the increase came smack in the middle of a recession, during the Gulf War, as the industry was at its softest point in years.

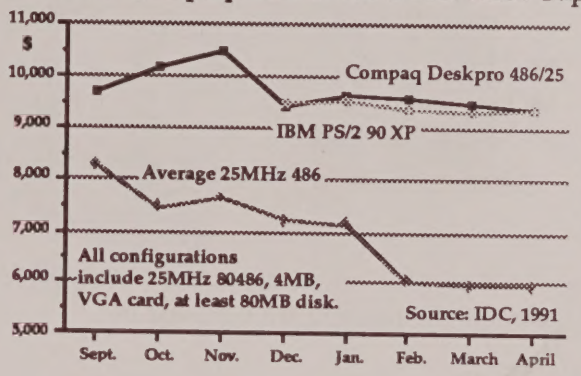
Largely in response to heavy price competition, Compaq and, to a lesser degree IBM, recently slashed dealer and list prices. Both look for similar results: market share. We note these points which may have prompted the Compaq and IBM actions:

- Mounting price pressure from clone makers. Those Dell advertisements must have worked. So too the "best buy" recommendations in PC magazines that refer to Compaq's list price in comparison charts and tables. Both combine to portray Compaq as overpriced, especially to cost-conscious new buyers.

- An increasingly homogeneous perception of PCs in the U.S. market. Gone are the days when Compaq and IBM alone ruled the top of the PC technology heap. Second-tier PC companies like AST, Dell, NEC and a handful of others are getting new technology to market with almost the same speed as the top-tier vendors.

- A tightening of PC expenditures. Whether it's a sagging economy or product cycle ennui, end users are inspecting PC purchases more carefully. As a result, they're shifting from Compaq to vendors with more economically priced brands. Brand loyalty is tenuous on low-end midrange PCs.

The IBM/ Compaq 25MHz 486 Street Price Gap



The net result? Compaq seems a winner. The announcement prices it back into the PC mainstream, albeit at the high end. But decreasing dealer discounts is tricky. Dealers will be tempted to jump to other manufacturers with bigger margins. Higher volume should more than make up for lower unit revenue for both partners. Compaq hopes so.

IBM still commands top prices. Most of its cuts were aimed at PS/2 products considered dead wood. Most of the discounts will

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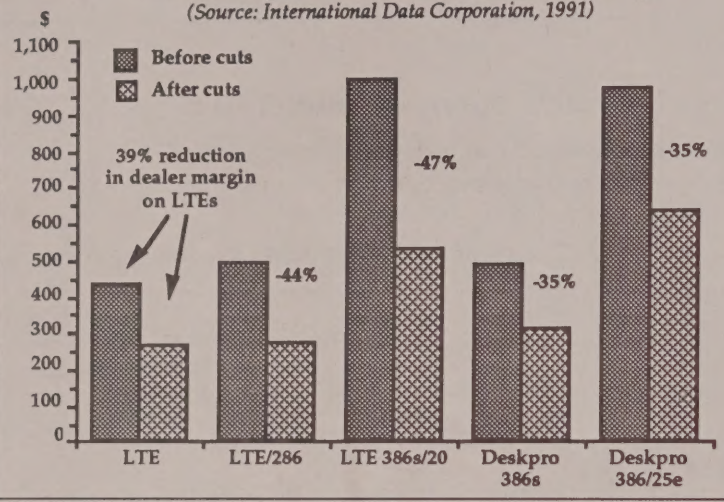
Price Cuts May Affect Dealers More than Compaq

Dealer Margins Before and After Price Cuts
(Source: International Data Corporation, 1991)



Compaq announced list price decreases that ranged from 26% to 32%. But dealers will shoulder the majority of the burden. Dealers' actual unit margin decreases (the difference between their unit cost and street selling price) will be closer to 40%, based on IDC's best forecast of the new street prices.

The dealers' response? Generally upbeat, despite the real decrease. Dealers using cost-plus pricing look at margin cuts as cost reductions. They also benefit more from higher volumes which the lower prices will drive, as well as from checks the new pricing puts on massive discounting.

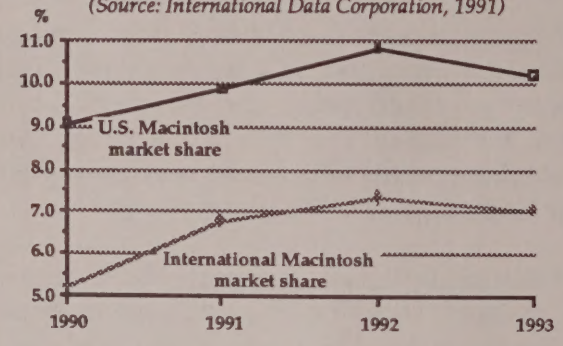
result in smaller street price cuts, even after Compaq's dealer cuts are factored in.

Price Cuts, cont.

Second-tier vendors will reexamine and adjust their pricing strategies. They have flourished largely on the ability to undercut top-tier vendors on price and must continue to offer a sizable price differential, or else users may see little advantage to buying second-tier systems.

Perhaps the most significant fallout from the announcement will occur in the dealer channel. Competition from alternative channels contributed to Businessland's huge ($42 million) first quarter loss. Compaq's announcement places even greater margin pressure on dealers. The squeeze play continues. These prices cuts will only accelerate the polarization of dealers — into superstores *or* VARs — and continue to put pressure on smaller retail stores, VADs and whatever else distributors in the middle are called.

After Price Cuts Apple's Market Share Rises
(Source: International Data Corporation, 1991)



IDC believes dealers will cautiously test Compaq's new pricing structure, maintaining a substantial portion of their previous profit margins. Those will drop only after competitive pressure or increased volume provide justification for change. Street price discounts will decrease by 10-15 points during the testing phase, and then creep back up as market pressure reduces dealer margins to an equilibrium of 7 to 8 points below former street price discount levels.

— with Brian Clarke and Pieter Hartsook

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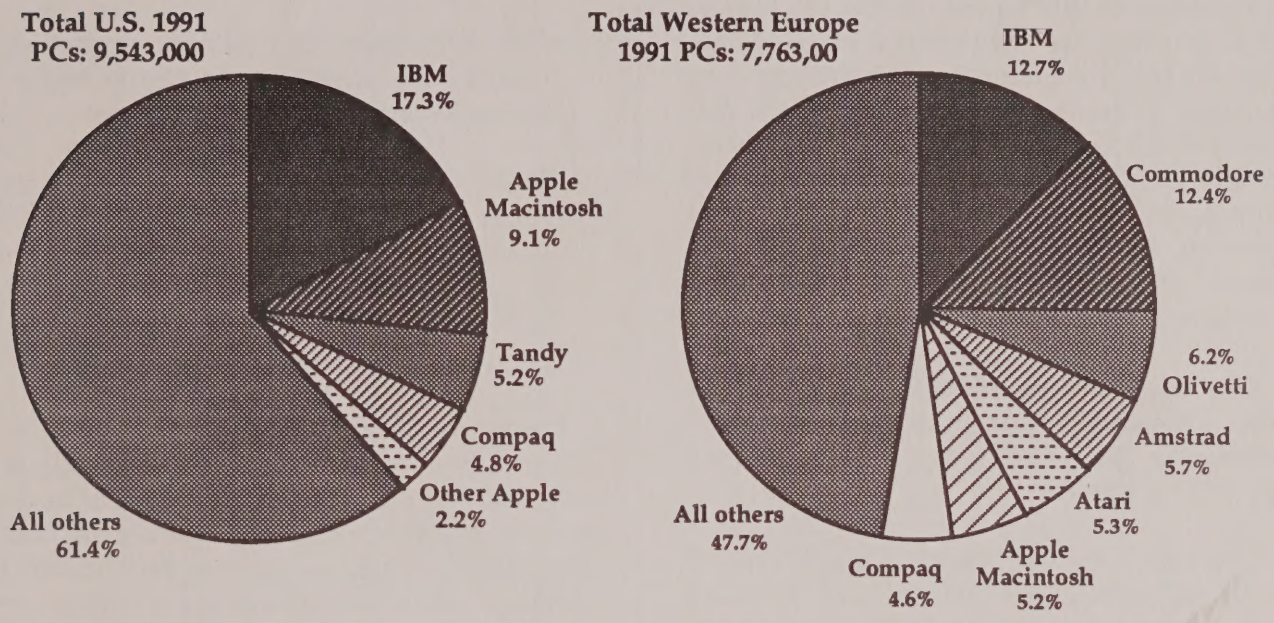
U.S. and Western Europe PC Unit Market Share of Leading Vendors

(Source: International Data Corporation, 1991)



PC Street Pricing: IDC Methodology Crosses Geographic and Product Lines

Personal computer street pricing information in this report has been excerpted from IDC's *PC Pricing Report* which provides monthly updates of list and street prices of leading desktop and portable/transportable MS-DOS and Macintosh PCs.

Models chosen for the survey are intended to cover the range of brands available on the market including: leading vendors (e.g., IBM, Compaq), vendors of low-cost products (e.g., Packard Bell), and vendors with direct distribution (e.g., Dell and CompuAdd).

Street prices are collected through surveys of storefront dealers across the United States. When available, print advertising is used to verify this data. The surveys are conducted in the first two weeks of each month. Average street pricing in the report represents single system purchases, rather than corporate or volume purchases. High and low street prices collected for each model are also listed, as well as the model's average discount. The list prices in the report represent the suggested retail price at the start of the survey period.

Since Dell, CompuAdd, and Tandy PCs are sold either through direct distribution (Dell, CompuAdd) or company stores (CompuAdd, Tandy), their list pricing is compared with the street pricing of PCs from other vendors. When a Tandy or CompuAdd PC is advertised below its regular list price, the discount price is listed as its street price. For these particular models the list, high and low prices, along with the average discount, are usually not-applicable (N/A).

For mass merchant systems street pricing was obtained through store visits, phone calls or print advertising. Although mass merchants institute uniform national street pricing to a larger degree than the traditional dealer channel, street pricing may vary due to local or regional promotions.

The *PC Pricing Report* is published for ten major U.S. metroplitan centers. National averages are publishedin a single additional report.

Large-Scale Systems Outlook

While 1991 will be the first full year for shipments of IBM's new mainframe family, IDC expects flat worldwide large-system growth this year. Economic uncertainty contributes to the malaise. But it is not the primary force behind continuing slack mainframe demand. Product cycle effects will simply not be enough to drive mainframe growth. Additionally, competition in high-end DASD markets will drive prices down without necessarily increasing demand.

Our relative pessimism is not limited to the U.S. market. European growth will be moderate as well. Only Japan appears poised for growth.

If we look forward to 1992, a full year of new-technology mainframes and a wider base of knowledge about the full benefits of S/390 would be expected to drive demand up. But demand is ultimately affected by changing customer perception of mainframe productivity. Some highlights:

- High-end customers are still engaged in learning — not purchase — mode relative to S/390.

- Slow demand is undermining vendors' efforts to stem discounting. In the IBM plug-compatible market, customers continue to successfully bargain vendors down to the $50K/MIPS range.

- New-technology S/390 won't begin shipping in volume until late in the third quarter. Hitachi's new machines are expected sooner, but will not be S/390 compliant until 1992. We don't expect either Digital or Tandem to have a dramatically greater impact this year than last.

- Six years of slow growth and the tremendous upgradability within IBM's mainframe product line (207 upgrade options have been offered since the 3090 family debuted) diminish product cycle effects.

- The marketplace appears less enthralled than it once was about mainframe investments as productive uses of capital.

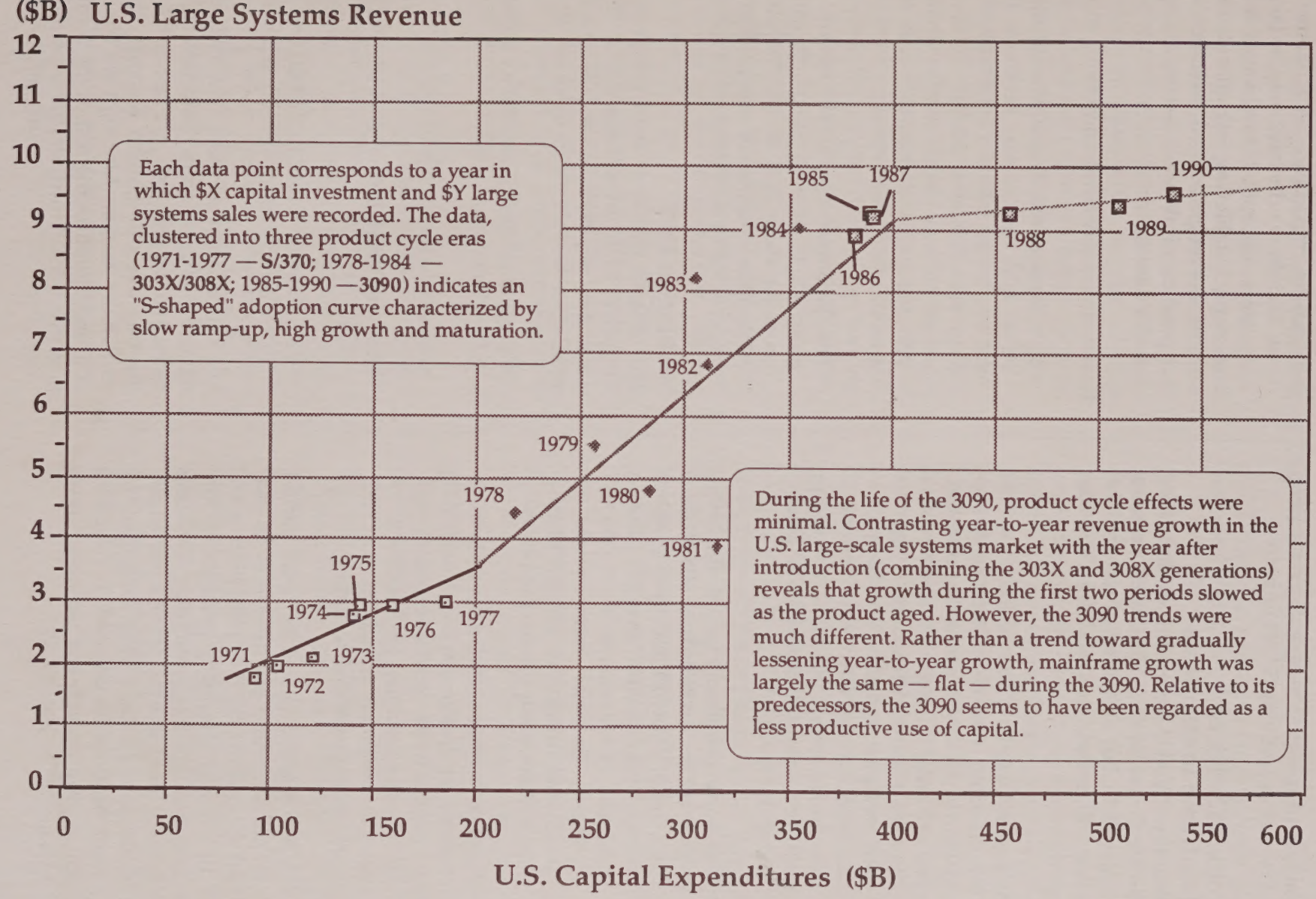
- IBM's 9121 midrange S/390 machines cover a significant portion of the ES/3090 family, obviating the need for 4381 users to jump to water-cooled platforms and, in fact, offering incentive for some low-end 3090 customers to downsize.

The mainframe marketplace is being driven less by vendors' capabilities to deliver new technologies, and more by users' abilities to absorb them. Traditional customer adoption barriers — technology (installed devices, software subsystems), organizational (skills, management structures and flexibility), application and financial — are emerging as the primary determinants of growth.

Is S/390 on Course?

Last September we lauded the S/390 announcement because of the way it addressed each aspect of customer adoption barriers: a high degree of reverse compatibility to avoid installed technology barriers; ESCON and special migration services to address organizational barriers; new programs and information on IBM's directions for mainframe application management; strong investment protection in the way of financial upgrades.

We also noted that the ES/9000 announcement required special attention to the application dimension. S/390 introduces many new technologies. Not only are all of the already announced ES/9000 tools and functions not available (e.g., SystemView), but large and obvious functional holes (e.g., database accelerators) exist. Uncertain economic times may be stalling purchase decisions, but customers may also be using the


($B) U.S. Large Systems Revenue
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500
550
600
U.S. Capital Expenditures ($B)
Each data point corresponds to a year in which $X capital investment and $Y large systems sales were recorded. The data, clustered into three product cycle eras (1971-1977 — S/370; 1978-1984 — 303X/308X; 1985-1990 — 3090) indicates an "S-shaped" adoption curve characterized by slow ramp-up, high growth and maturation.
During the life of the 3090, product cycle effects were minimal. Contrasting year-to-year revenue growth in the U.S. large-scale systems market with the year after introduction (combining the 303X and 308X generations) reveals that growth during the first two periods slowed as the product aged. However, the 3090 trends were much different. Rather than a trend toward gradually lessening year-to-year growth, mainframe growth was largely the same — flat — during the 3090. Relative to its predecessors, the 3090 seems to have been regarded as a less productive use of capital.
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economy as a reason to spend greater time and resources studying S/390 impacts.

Product Cycles and Mainframe Investments

Will the ES/9000 generation exhibit characteristics more like the 303X/308X or more like the 3090? For a number of reasons, the market will probably show slower 3090-like growth.

- Upgradability is a double-edged sword. By ensuring that older technology remains viable, IBM is protecting customer investments. However, it is also forced to compete with an increasingly vigorous used equipment market. Without clear differentiation between new and used, price/performance points on new equipment are strongly influenced by pricing in the used market.

- Mainframe complexity gets worse before it gets better. Architectural abstractions (AD/Cycle, SystemView and Sysplex) promise productivity benefits. But a great deal of uncertainty about delivery schedules, financial commitments required, and impacts on current installations will discourage many customers.

- Aggressive discounting adds little to total demand. Customers are more willing to upgrade to the most discounted, highest capacity machine. Little evidence exists that customers are adding new footprints in response to discounting.

- DASD price drops. Last year, strong DASD demand supported the slack market for processors. This year, pricing will come under increasing pressure as Amdahl and HDS begin shipping 3390-class devices. But these factors will put greater downward pressure on pricing than upward pressure on demand. We expect a slight drop in high-end peripheral revenue in 1991 — about 1.2%.

- Increasing importance of economic cycles. Mainframe demand may be becoming more susceptible to changes in the economy. Achieving significant mainframe market growth will be difficult, independent of all other factors, if capital markets are tight.

However, we note two positives:

- Both Tandem and Digital should continue to add incremental revenues ($750 million to $1 billion combined) to the large-scale systems market. Neither is poised to steal much market share in 1991, but both will enjoy at least as much growth as they did in 1990.

- The Japanese mainframe market will grow 9% to over $8 billion. It will account for about 27% of the 1991 market. A shrinking portion of this growth will be captured by non-Japanese suppliers.

Looking to 1992

IDC remains cautious about the prospects for growth in the mainframe market for the remainder of 1991. Over the next six months, we will scrutinize these key signs:

- Levels of customer uncertainty about key S/390 functions.

- Activity in the used 3090 market.

- Economic conditions, particularly in Europe.

- Adjustments to IBM's ES/9000 and PCM S/390 compatibility delivery schedules.

The combination of more new technology models, less uncertainty about new technologies, and the prospects of a stronger economy improve our growth scenario for the mainframe market. Although we believe it will underperform the rest of the computer industry, 3-5% growth in 1992 is possible.

— with Peter L. Burris

Tough Times in Maynard: A Digital Retrospective Q3FY91

Slow sales, depressed earnings and economic uncertainty have put Digital Equipment Corp. in a state of flux. The result: internal reorganization and workforce reduction. IDC expects Digital to trim its workforce by as many as 3,000-5,000 in the coming months. One report predicts the termination of any salesperson who has been unable to meet quota over the last two years.

With shipments of RISC/Ultrix workstations, VAX 6000s and VAX 9000s lower than projections, Digital needs to cut costs. Lackluster Q2FY91 earnings ensure that Digital will intensify its cost-cutting measures and marketing campaigns during the coming months. A brief summary of Digital's status:

Low-End Upgrade,

Early this year, Digital fortified the center band of the three-tiered low-end VAX lineup with the VAX 4000 Model 200, offering 50% greater CPU performance than the systems it replaces. The advent of the new VAX 4000 family precipitates the retirement (by July 1991) of most MicroVAX 3300, 3400, 3500, 3600, 3800 and 3900 systems. Digital extended DSSI support to the VAX midrange, driving per-megabyte costs down to the $13 range.

VAX 6000 Price Cuts

In late April Digital slashed VAX 6000 system and upgrade option prices by up to 69%. Vector processor 6000 prices remain unchanged, reflecting strong demand. Whether or not the new prices are attractive is debatable. Nevertheless, positioning and self-impact issues remain. Low-end 6000s remain vulnerable to VAX 4000, while high-end configurations encroach on the 9000 space.

VAX 9000 Lite

In response to softening demand for its high-end VAX systems, Digital in February unveiled scaled-down VAX 9000 configurations. The cost of an entry-level system was trimmed to slightly less than $1 million.

The recent disappearance of VAX 9000 pricing from Digital's online Electronic Store makes it difficult to judge whether or not the "VAX 9000 Lite" systems are priced great, but they are less filling (less memory, fewer service/support amenities, no commercial instruction set hardware or multiuser operating system license). The technically optimized, commercially lobotomized performance reflects Digital's efforts to target technical users with economy-class VAX 9000 systems whose capabilities are inappropriate for commercial applications.

VAXft (The Sequel)

Digital's March 18 rollout of a family of fault-tolerant VAX systems was designed to exploit fault-tolerance as an attribute that differentiates and adds value to the company's proprietary system offerings. Four new VAXft models, costing from $50K to $1 million were unveiled.

The new systems addressed some of the economic and technical vulnerabilities inherent in the original VAXft system. Nevertheless, the 6VUPS maximum single-stream performance and the continued absence of VAXcluster CI-bus support remain as VAXft limitations.

Workstation Fire Sale

Digital claims that sales of RISC/Ultrix systems and workstations have doubled on a year-to-year basis. But shipment levels remain comparatively low and should not significantly affect Digital's market share in workstation markets. Workstation prices are commonly discounted by 40% or more, the result of an unofficial policy stating that Digital will lose no sale due to price.

— with Terry C. Shannon

4th Front
Donald Bellomy
Qty: 1 G,A,J

AT&T will acquire NCR in a stock deal valued at $7.4 billion. No synergy, eh? Guess there is some after all. A few thoughts: The company must reorganize its combined computer operations, most likely along NCR's line-of-business model. The company has pledged to support both customer bases and provide AT&T customers with migration paths — though no explicit plans to kill any product were revealed. Both companies have similar long-term product visions, based on distributed, Unix V.4-based systems often with Windows PCs as clients. Both are moving to Intel processors and using object-oriented workflow software based in part on HP's NewWave. Product line resolution should be relatively simple: the company should eliminate one Intel line (its Starserver more likely than NCR's 3000) and merge the two groupware lines (Rhapsody and Cooperation). AT&T is currently planning on a future high-end MIPS-based RISC line, building off its OEM relationships with Pyramid and Tandem. NCR's investment in Teradata for high-performance database engines would seem to spell trouble for Pyramid, but should not affect Pyramid's sales to AT&T over the next 9-12 months. Plus, NCR's lack of investment in fault tolerance may leave space for Tandem, and thus for a RISC line. NCR's Top End competes with AT&T's Tuxedo transaction monitor for Unix. It, and NCR's acceptance of OS/2 as a server operating system, may be at risk. On the PC side, the company must resolve AT&T's preference for EISA versus NCR's Microchannel orientation, but otherwise let NCR's PC experience play out. **On the bright side:** the two are already one-two in commercial Unix small systems, and the merger combines complementary market strengths. NCR is strong in retail and branch banking, and has presence in Europe and the Pacific Rim. AT&T is strong selling to the RBOCs and the U.S. government, as well as to hotel chains. Still, significant challenges remain: any delay in the two companies' product transitions could be disastrous, given HP's rapid growth in Unix minis and the potential of IBM, DEC, and Sun. AT&T's weakening ties with Olivetti are probably severed. And, neither AT&T nor NCR has had much success selling into corporate MIS, nor at selling next-generation development platforms. Both have to convince MIS that networked servers can support and/or supplant mainframe applications, and any confusion in marketing and sales messages to that skeptical crowd will be harmful, if not deadly.

Apple reestablished its 18- to 24-month lead in operating systems by delivering System 7. While not quite on time, System 7 debuts ahead of the gloomiest predictions, including somewhat skeptical prognostication in these pages. Its elegance makes DOS/Windows construction look a little silly. But Apple still has one big hole (servers) even despite the recent rash of successes (see p. 2). Watch for new high-end systems that take better advantage of the 32-bit power of System 7 — as well as high-end printers — soon.

Cray Research reported strong first quarter results. The company will reach revenue goals for the year, meaning 8-10% growth over 1990. While Convex has yet to ship even a beta version of the "Cray-killer" C3, availability is not a problem for Cray. Maturity is. Cray needs to rally around the opportunity to exploit the critical window of opportunity the C3 problems create.

Compaq is buying back shares amid reports that first quarter U.S. sales are off 50%. Sun may well report higher Q1 sales.

Tandy and CompuAdd introduced new multimedia computers (a PC and CD-ROM optical drive) and upgrade kits compatible with the Multimedia PC specification, a standard proposed by Microsoft. But loads of other PC companies will soon follow: it's only CD-ROM, audio and video support. The hard multimedia stuff is applications. Not much progress there, yet.

THE GRAY SHEET
Computer Industry REPORT

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Host Environments and Vertical Markets: Indices of 1991 U.S. IT Market Trends Client/Server Computing and Open Systems Commitment as Test Cases

What do users want? Why do they buy, and why don't they buy?

This past winter IDC conducted its largest user survey ever, an in-depth analysis of around 1,850 known information processing sites in the United States. The goal was to quantify customer reactions to key industry issues, to measure if or how customer behavior has been changed by questions of war and recession, and to provide primary input to IDC's major forecasts for 1991.

One of the advantages of implementing a survey of this scope was that it not only allowed us to ask users a number of questions about their spending plans in 1991 and the strategic decisions they are making today about their information processing requirements in the years to come, but it also gave us a sample large enough to see the impact of two critical variables in their decision-making process: their host environment and the industry in which they participate.

Two test cases from the survey indicate that the relative importance of either variable depends on the question, but both typically play a critical role.

The survey instrument was designed to cover a broad spectrum of industry topics, including:

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- "Downsizing" of applications onto less expensive systems
- Client/server strategies
- Systems integration and outsourcing options
- Unix-oriented open systems strategies
- The software workload by type and source of application
- The number of PCs to be acquired, and where they will be purchased
- Anticipated growth in MS-Windows installations
- Anticipated growth in PC LANs
- War and recession as factors inhibiting spending
- Pressure from management to keep capital equipment spending down, to hold the line on staff costs, etc.
- Budget growth by line item: staff; mainframes, minicomputers, and peripherals; PCs, workstations, and LANs; packaged software; outside contracted services; and all other costs

The survey base was divided roughly equally among sites whose senior system was:

- An IBM S/370 or compatible mainframe
- A non-IBM-compatible mainframe (primarily Unisys and Bull)
- Digital Equipment Corporation minicomputers running VMS
- IBM AS/400, S/38, and S/36 minicomputers
- Proprietary minicomputers from vendors other than IBM and DEC
- Unix systems

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- Sites with 10 or more personal computers

After data from the 1,500 sites in the first six multiuser system categories was normalized against the overall U.S. market, IDC analysts then segmented the total by 11 vertical markets, plus "Other":

- Banking
- Insurance and other nonbanking financial
- Manufacturing: industrial equipment
- Manufacturing: other durable
- Manufacturing: nondurable
- Health services
- Business services
- Miscellaneous services
- Transportation/communications/utilities
- Retail
- Wholesale

Note that government and education are not included; because of the unique procurement policies, issues, and constraints within these sectors, the survey was designed to exclude these sites from the sample base.

The survey indicates that, while the host environment is the most critical factor in shaping user attitudes and spending patterns for some issues, for others the industry in which customers participate is the primary predictor. Even when the host or industry seems to be the key indicator, the other factor usually plays a major role, especially at the high and low extremes for user demand.

Two Test Cases

From the survey data we have selected two issues to test the relative importance of host environments and vertical markets:

- Client/server computing
- Unix open systems

As in other reports based on the survey, we have found it useful to break out mixed proprietary/Unix sites from proprietary-only and Unix-only environments. In our analysis of the two test cases, the data for "Other" has been omitted in the industry figures.

Client/Server Computing

Few topics have generated more press releases from anxious vendors than client/server computing. Many IT providers and users who used to talk about ending "islands of automation" through distributed computing have come to recognize that the desktop revolution has forever shifted the boundaries of discussion. Now, rather than distributing applications down from the mainframe, the issue has become integrating the work occurring on PCs and workstations.

But what exactly is client/server computing? Some will tell you that they were implementing client/server architectures twenty years ago. Others will shrug that the concept is probably half a decade away from effective realization.

In this definitional fog, perception is everything. IDC therefore chose in this survey to elicit attitudes towards the concept of client/server computing without defining the term. We wanted to help clients to understand what users are thinking with as little prodding as possible.

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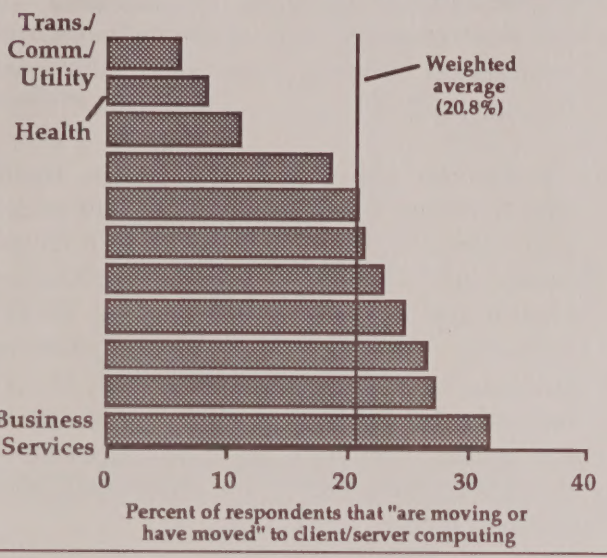
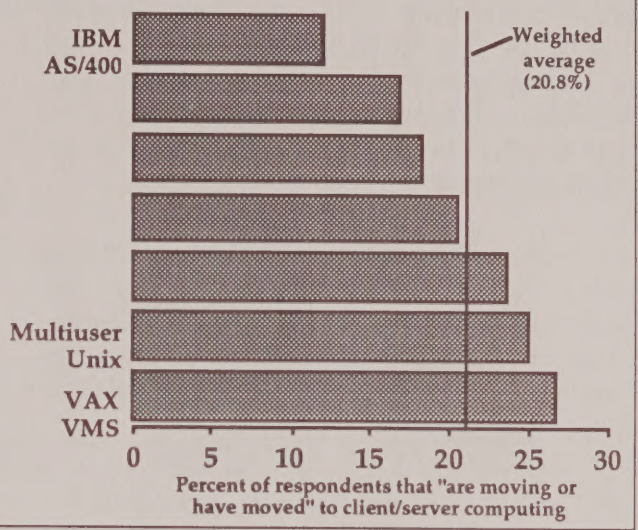
Attitudes Toward Client/Server by Host and Vertical Market

(Source: International Data Corporation, 1991)





The responses provided one of the most illuminating examples of the different ways in which host environments and vertical markets shape attitudes: a little over a fifth of the U.S. commercial market feels that it has already moved to client/server computing or is well on its way. For users who say that they made a commitment to the concept prior to the survey, the data suggests that the industry in which users participate is a better predictor than the senior system in use at their sites.

Business services leads the list among vertical markets for existing commitments to client/server computing, with 32% (a full 11% above the mean) checking off the first choice offered by the survey. Retail also scores high, with 27%.

Just as worthy of notice are the industries where the concept has so far made little physical headway. Only 6% of the transportation/communications/utilities grouping, and a little over 8% of health services, feel that they are currently moving or have already moved to client/server computing.

But the sharp variations by vertical markets do not mean that the host environment was not an important issue as well, even if the highs are not as high and the lows not so low. It is probably not coincidental that the highest scores for existing client/server architectures went to the VAX/VMS environment, where Digital customers have been buying into distributed computing notions for years, and multiuser Unix, where vendors were among the first to push the concept.

Nor should we ignore the low penetration (12%) among AS/400 customers. Because the S/3X follow-on is the youngest of the environments in our list, with shipments coinciding with the emergence of client/server computing, one might infer that users have been choosing one over the other.

One way to test this hypothesis would be to compare not just existing implementations, but all positive attitudes towards client/server computing, including sites currently only mulling the possibility. In terms of the survey questionnaire, this would mean combining responses to the first three statements (We are moving or have moved, We are planning to move, and We would like to move, but are unsure of the best path).

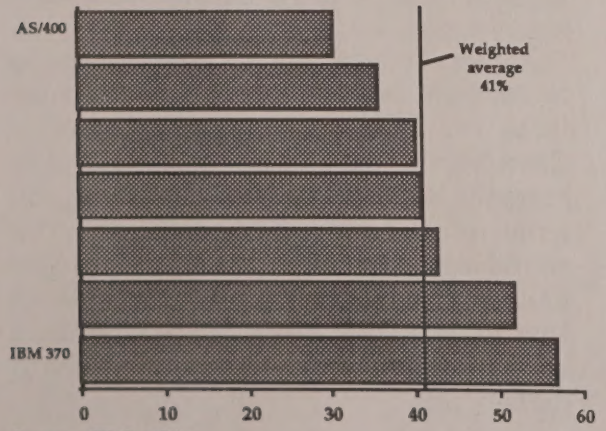
AS/400 sites indeed have the lowest regard of any host environment for client/server computing — only 30.5% checked off one of the first three statements, compared to an average of 41%. In other words, AS/400 sites will continue for the immediate future to offer comparatively slim pickings for client/server advocates.

This low rating takes on additional significance. For if industry participation is the best clue to existing client/server architectures, the host environment at a site is the best gauge of overall positive attitudes towards the client/server paradigm.

No vertical market has anywhere near the positive ratings for the concept given by IBM S/370 and DEC VAX sites (57% and 52%, respectively). The S/370 figure is especially interesting, since IBM-compatible mainframes were only around the median for existing implementations. S/370 users have read about the concept, and are impressed with the possibilities.

Again, though, the other set of variables tell an important, even if less dramatic, story. Retail is no longer among the vertical market leaders — in fact, as we turn from existing implementations, it is near the bottom of overall positive attitudes. This suggests that demand for client/server computing at additional sites in this industry will not be strong, and that vendors should concentrate on building business at their existing accounts.

Proportion of Respondents with Positive Attitude Toward Client/Server, by Host



Source: IDC, 1991

Moreover, although no industries match IBM S/370 or VAX VMS sites in their excitement about a client/server future, a couple match AS/400 sites in their nonchalance. Health and wholesale only register 29-30% positive ratings; the transportation/communications/utilities group has moved towards the median, which suggests room for vendors to help shape the decisions of users who have hitherto paid little attention to client/server computing.

Unix Open Systems

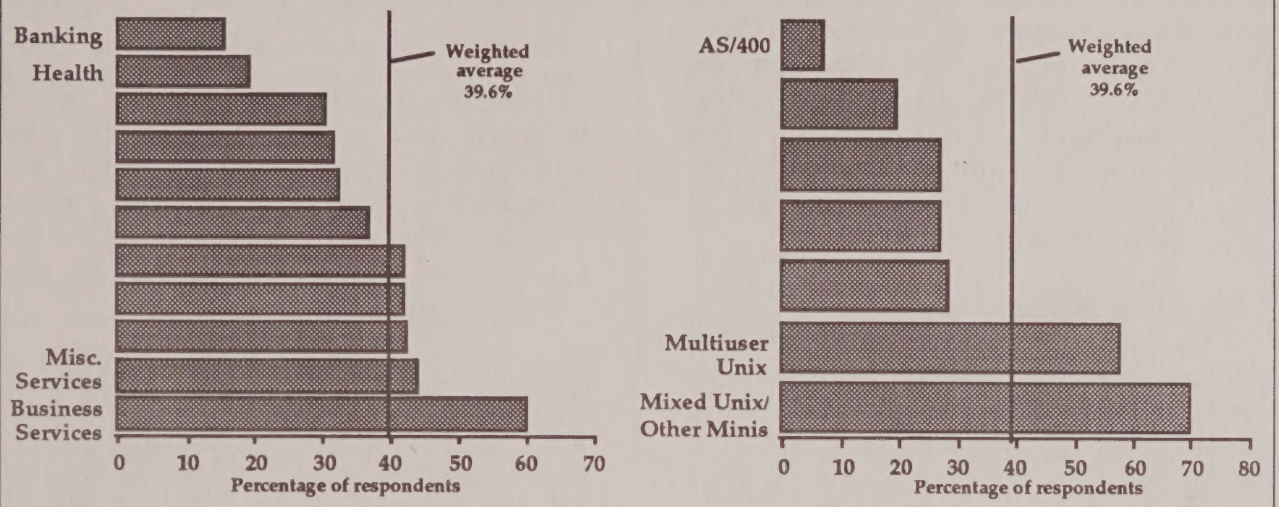
"Client/Server" has been a hot topic for about a year and a half. "Systems Integration" was hot three years ago, but has apparently yielded pride of place to "Outsourcing." For consistency, though, for almost half a decade now, the hottest of the hot topics remains "Open Systems."

Conceptually "open systems" is scarcely more lucid a term than "client/server," but there has always been a tendency to equate it with a Unix-based strategy. We therefore asked survey respondents "Is your organization actively pursuing a Unix-oriented open systems strategy?" with choices of yes, no, and no but considering.

It's still hot, and getting hotter — almost two-fifths of the survey base said that they were indeed pursuing a Unix-oriented open systems strategy, the highest proportion we have seen when surveying users about Unix plans. The ratio is especially impressive considering our efforts to exclude government and education sites from the survey base.

It should come as no surprise that the best indicator of a commitment to Unix open

Proportions of the U.S. Commercial Market Actively Pursuing a Unix-Oriented Open Systems Strategy by Host Environment and Vertical Market
(Source: International Data Corporation, 1991)



systems is the host environment. After all, since Multiuser Unix and Mixed Unix/ Other Minis were two of the categories, it would be distinctly odd if they did not show overwhelmingly positive results.

As indeed they do. In the Mixed Unix/ Other Minis category, 70% said they were pursuing a Unix-based open systems strategy, while 57% of the multiuser Unix base checked the "Yes" box.

The higher proportion of mixed Unix and proprietary environments agreeing with the statement makes sense, since these represent the sites that have begun substituting Unix systems and applications for proprietary midrange products. Presumably many multiuser sites running only Unix are not pursuing an open systems strategy per se, but are buying application solutions on cheap boxes.

Host environments account for both the highest level of commitment to Unix open systems and the lowest: only 7% of AS/400 users are pursuing a Unix strategy. This substantiates IDC's long-standing view that the Unix open systems user is fundamentally a completely different personality type than the AS/400 customer, with vendor independence requiring risks and systems integration burdens that many users are unwilling to assume (see, for example, *CIR 24:10*, November, 1988).

But between these extremes, the variations are not particularly wide among users of DEC VAX systems, other proprietary minis, S/370 hosts, and other mainframes. In each of these traditional proprietary strongholds, between 20% and 28% of the user base say that they have embarked on a Unix-oriented open systems strategy.

Because the future of Unix open systems rests with these users, it is important to know what can tip them one way or the other. Figure 6 suggests that vertical markets will play some role in these decisions.

Most of the industries in the survey base fall around the median, or a little below. But one (business services) is in the same vicinity as multiuser Unix sites, while two are noticeably recalcitrant — health and banking.

Conclusion

Still, some guideposts are better than none at all. The chief lesson to be drawn from the survey is that both host environments and vertical markets are critical factors in shaping user attitudes on different questions (or, as in the case of client/server computing, different aspects of a single question). Even where one set of factors seems to dominate, the other usually plays a role, especially at one or both extremes.

Because of the importance of both factors, IDC is paying increasing importance to them in our regular research. Host environments are in growing use as an alternative to our traditional large-scale, medium-scale, small-scale, and PC/workstation market categories, while many programs are focusing on the role vertical markets play in their sectors.

A series of host-specific reports are also being prepared. Studies on the S/370, Other Mainframe, DEC VAX, Unix, and AS/400 environments will add to the common questions an analysis of the 30% of the questions that were specific to hosts (e.g., for VAX sites, the number of VAX 9000s to be acquired in 1991, and the level of commitment to VMS). Two abridgements of the vertical market study tailored for special sectors should soon be ready. These will deal with the questions related to PCs and software, respectively.

Up to four reports (retail, banking, manufacturing, and possibly health) will deal with specific vertical market groupings. Besides presenting the data on those markets from the larger study, these reports will include shares of the installed base by size class in the industries included.

Additionally, a report on client/server computing will include cross-tabulations with a number of other questions in the survey to bring this issue into even sharper focus.

Finally, this survey can serve as a necessary context for more granular investigations. IDC stands ready to implement this survey in whole or in part to smaller universes, including particular industries, whether to the survey sites or to a survey base of the client's choosing.

— with Donald Bellomy and David Moschella

ICL to Merge with Nokia Data, Increasing Fujitsu's European Influence

Combined company, $4.14 billion in 1990, would have been fifth largest supplier in Europe last year

One obvious highlight of Fujitsu's ownership of ICL is financial leverage. ICL is parlaying Fujitsu's deep pockets into European market share: on May 29, ICL and Nokia Data announced their intention to merge.

Upon completion of the merger in September, ICL will purchase Nokia Data for $402 million, 80% in stock. Nokia will gain one place on the ICL board and a 5% share of ICL plc. The deal is dependent upon approval by the European Community, and the new company will employ 24,000 — implying reductions of 3,400.

The Players

Nokia Data, with 1990 sales of $1.3 billion, has been part of the Nokia Corporation since Nokia bought Ericsson in 1988 for $220 million. It claimed an installed base of 1 million PCs/workstations, 20,000 PC-LAN installations, and 3,000 Unix computers by yearend 1990.

ICL's 1990 results showed flat revenues at $2.8 billion, with reduced pretax profits of $196 million. The merger with Nokia Data will create a new company whose revenues would have been $4.1 billion in 1990, fifth in

European markets behind IBM, Siemens Nixdorf, Digital, and Olivetti.

Fujitsu operates under its own name in Spain, following the acquisition of the government-owned Secoinsa in the early 1980s. Its acquisition of an 80% holding of ICL in 1990 was followed by a public statement of ICL's intention to purchase Mannessman Kienzle, though it was beaten out by DEC.

In addition, Fujitsu's 49% stake in Amdahl has important European implications: a technology agreement with Siemens Nixdorf for components of the higher-level 7500 mainframes (specifically the H60 and H120 models). In 1990 Fujitsu also began to market its own mainframes, running the MSP operating system from a division in Frankfurt, Germany.

So far there is little indication that Fujitsu seeks to combine all its European operations under a single organization and name. It appears to allow its operations a significant degree of autonomy. This merger is between ICL and Nokia (not Fujitsu and Nokia). Any changes at Nokia Data are likely to be the result of the integration of the two "European" companies.

The Implications

Nokia Data's relationships with other suppliers for the distribution of products in Finland will now come into question. A month ago discussions with Bull to extend marketing agreements were called off; HDS's partnership with Nokia Data could also be cancelled. It is likely, however, that Nokia's distribution of Tandem systems in Finland will continue. Where Nokia Data acts as an agent (e.g., for Bull DPS 9000 systems), end users will have to adjust to altered supplier relationships.

ICL itself has already acquired a number of companies, including RC Computer in Denmark in 1988 and Databolin in Sweden in 1990. From a geographic coverage perspective, a merger with Nokia Data looks very attractive.

The new company will have a good share of the markets in Finland and Sweden and will increase its presence in Germany. Nokia claimed that Nokia Data's sales for the first four months of the year have put it on track to operate at a profit for 1991 — countering any suggestion that the merger is the result of financial failure at Nokia Data.

There is also a relatively good fit between the product lines of the two companies. Both are currently selling Unix minis (ICL's Sparc-based Unicorn systems are also being resold by Nokia Data), with ICL strengths lying in mainframes and Nokia Data's in PCs and terminal systems. ICL's recent introduction of a global sales division dedicated to the financial sector is also significant, given Nokia Data's strength there.

What Now?
ICL's Challenges

We believe that ICL's near-term aims are three. It must solidify its relationship with the European Community to ensure that it passes its investigations of the monopoly issues, streamline the new organization — especially in countries where both ICL and Nokia Data have a significant presence, and reorganize distribution relationships with other vendors in Finland.

During the next three to nine months IDC will watch three areas to evaluate the success of the merger: the combined company's financial results, whether other European vendors relax their current objections to ICL's "Japanese" status, and customer reactions (especially in Finland).

— with Martin Hingley

Computer Industry News ... Computer Industry News ... Computer Industry News

AT&T sold its 19% stake in Sun Microsystems. The liaison fell far short of its original goal to "redistribute wealth in the computer industry" by raising Unix's credibility and establishing Sparc as its chip (via the Intel/DOS model). It ultimately fell victim to the NCR takeover. Meanwhile, **SunSoft**, the **Sun** subsidiary aimed at increasing the visibility of Sun's Unix, has 600 employees, two-thirds in engineering. That's bigger than Novell, bigger than Oracle and about as big as Microsoft's OS group. Could be the world's biggest software startup ... ? **Oracle**, by the way, agreed to sell as much as a 9.8% stake in itself to Nippon Steel over ten years. Nippon and Oracle will jointly distribute Oracle products in Japan through a 51% Oracle U.S.-owned subsidiary.

The Unted States and Japan announced a refinement of their five-year old plan to ensure that non-Japanese companies hold somewhere near 20% of the Japanese semiconductor market. In the midst of an impending U.S. accusation that Japanese manufacturers are dumping flat-panel displays in the U.S., we say: so much for free trade.

Ken Olsen told analysts that DEC now thinks of its business in four major groups: VAX VMS, systems integration, customer support, and *commodities* (PCs, workstations and Unix). Last time we checked DEC was hardly a low-cost manufacturer. What does that mean for DEC? A focus on support, value-added software, maybe even systems integration. And a couple of lean years.

IBM and Apple are exploring potential technology swapping agreements: RS/6000 RISC for Mac OS. IBM, meanwhile, will announce enhancements to the midrange of its PS/2 line — running both MCA and AT busses — and expanded memory and disk sizes. It will beat Intel by announcing a 50MHz 80486DX upgrade card.

Siemens-Nixdorf is in the final phase of negotiating a technical and industrial agreement with SMT-Goupil, France's last remaining independent maker of PCs. Siemens is, apparently, poised to take a 20% stake in SMT-Goupil, which was barely profitable last year.

NCR's new 3600 faces a squeeze between mainframes and Unix superminis. NCR has added a front-end processor to the Teradata-style, parallel-processing SQL engine, allowing standalone Unix configurations. However, NCR probably won't have much success selling against traditional mainframe applications — rather, it will have to stimulate demand for massive, online decision-support systems. There it faces an initial shortage of development tools and lacks IBM's experience selling million-dollar systems to MIS. Current Unix database engine players Sequent, Pyramid, and Hewlett-Packard will face more NCR competition from its more aggressively priced, tightly coupled, 8-way multiprocessor 3500 line, due for late summer shipment. We do not expect significant 3600 revenues until 2H92.

The Open Software Foundation has chosen a compiler intermediate language that enables applications to be distributed in the same format for different hardware. The Architecture-Neutral Distribution Format (ANDF) was to be OSF's answer to the AT&T-blessed ABIs: it provides the benefits of a standard binary interface (plentiful portable software) without requiring a specific microprocessor. But its immediate benefits are not enough to outweigh the costs and business-model restructuring it requires.

In the onward and upward department, former IDC CEO Axel Leblois has been named president of Bull HN. Essentially, the move exemplifies the integration of Bull HN within Groupe Bull. *Bonne chance!*

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Fault Tolerance: Niche or Not?

Worldwide growth rates are slowing, but they're still about twice general-purpose systems' growth; the high-availability features of general-purpose systems are beginning to cloud the boundaries which protect fault-tolerant niche competitors

One computer vendor has made a killing selling fault tolerance. Two others have built respectable, profitable, businesses. All outperformed a bevy of potential competitors — with names like August, Auragen, Nohalt and Synapse — by getting uncompromisingly reliable products to market fastest.

Tandem's, and to a lesser degree Stratus's success attracted a lot of attention. Mainstream systems vendors began touting products with adjectives like "virtually fault tolerant," and "high availability." Combined with new truly fault-tolerant (FT) systems (from Digital, e.g.) the FT market is getting crowded with hungry competitors. Is the FT market big enough for all? We note these demand factors:

- Traditional fault-tolerant market segments like banking and finance are becoming saturated, leading to slower growth.
- A lack of migration tools/utilities and application development strength will act as barriers to the alternative-architecture fault-tolerant offerings targeted at displacing existing large systems.
- Survey data indicate spending for FT systems will be greater in three to five years.
- Over the long term, high-availability offerings from traditional system vendors without the price-premium penalties associated with fault-tolerant systems will reduce fault-tolerant spending.

IN THIS ISSUE:

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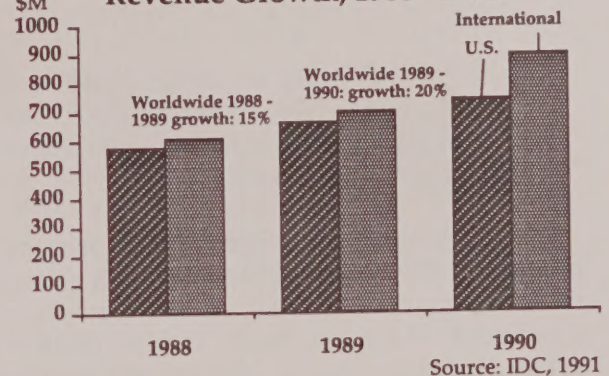
LAN Servers: 1991 U.S. IT Trends 3
Computer Industry News 8

U.S. and Worldwide Fault Tolerant Revenue Growth, 1988 - 1990



Source: IDC, 1991

The worldwide fault-tolerant market has grown from approximately $500 million in 1984 to slightly over $1.6 billion in 1990. International market growth increased again in 1990, fueled by an incremental $28 million from Digital. Fault-tolerant sales in 1991 will be 13-18% higher than in 1990. International Data Corp., publisher of the *Computer Industry Report*, expects worldwide compound growth for fault-tolerant systems to slow to 10-15% over the next three to five years.

While still double some industry segments, that's low for Tandem and Stratus. Their challenge is to continue to exploit growth in a niche market that is becoming less and less niche-like.

Slow Short-Term, Faster Long-Term Demand

Results from a recent IDC survey of approximately 100 MIS senior decision makers indicated acquisition criteria for the following three system classifications: general-purpose, high-availability, fault-tolerant systems. We identify the following acquisition priorities:

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- Absolute performance levels and hardware/software reliability were top priorities with little discrimination as to system type.

- System price is considered the next priority, with most fault-tolerant respondents ranking cost of systems lower on the scale than high-availability or general-purpose systems.

- Two other characteristics worth noting are dynamic system reconfiguration and vendor reputation.

- Only a few additional responses suggested third-party software availability and ease of system use as potential decision criteria.

- Adherence to existing or emerging standards is also frequently viewed as a decision criterion, suggesting demand for Unix-based fault-tolerant systems will continue to grow.

Fault-tolerant market growth will remain relatively static for the next one to two years, with more potential growth beginning in the three-year-plus time frame. The market leader Tandem (with 71.9% of the fault-tolerant market) has indicated much lower growth than previous years. Ominously, it has stopped making formal projections for future business potential on a quarter-to-quarter or year-to-year basis.

Trying to Create Demand

Companies are trying hard to push fault-tolerant technology. Several new systems could impel slightly higher growth in 1991:

- Tandem's improved CLX models and RISC-based CLX systems by yearend

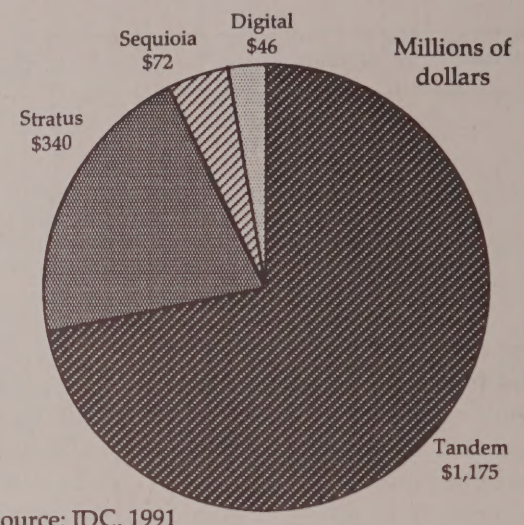
- DEC's enhanced VAXft offerings with substantial price/performance improvements

- Stratus's introduction of RISC-based systems with improved price/performance over existing systems

- Sequoia's expected enhancements to its 300 Series and a new 400 Series in 3Q91

- Potential startups with low-end systems targeting office or departmental applications.

Worldwide Fault Tolerant Computer Systems Market Share, 1990 Revenue



Source: IDC, 1991

Saturation in traditional market segments in the U.S. will force companies to seek new markets. Telecommunications and process control might allow them to maintain previous revenue growth rates. However, interest in the telecommunications market seems to be centered on Unix-based alternatives with limited scalability.

Spending on fault-tolerant systems will increase slowly over the next two to five years, according to planned IS budget spending. High-availability features (such as fail-over capability in IBM's Sysplex environment), redundant power supplies, and system error detection and correction through intelligent console processing are likely to dilute fault-tolerant system spending over the long term.

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While Tandem has lost fault-tolerant market share over time, it has maintained its position in IDC's medium-scale market and made a significant impact in the large-scale market with its Cyclone product family. Tandem will continue to lose fault-tolerant market share on the basis of increasing competition from DEC and Stratus.

Fault-tolerant vendors are focusing on selling solutions that also provide fault tolerance as a value-added feature, rather than targeting the original fault-tolerant applications. That is a more challenging task when customers demand more cost-of-ownership qualification, while at the same time the nature of fault-tolerant systems dictates that customers pay a premium. The most successful vendors will be those which reduce the premium required for fault-tolerant architecture and provide potential customers with a path of least resistance when considering application development and migration.

The Future of FT

The differences between fault-tolerant and highly available systems are blurring. But new technologies and capabilities are always ascending to provide smoother, faster or easier continous processing. Some emerging trends in fault-tolerant systems include: the abiity to load new operating system software without bringing the system down, the abiity to load new application software without disrupting application service, super fast recovery, followed by, perhaps, human error tolerance.

Users are less interested in how fault-tolerance is implemented than in cost effective solutions. Strategies which stress solution-based alternatives are still viable in the maturing but not yet mature FT market.

But with the lack of a broad range of tools and utilities to assist in customer migration, the fault-tolerant market is still very much a series of specific customer solutions: financial, process control, retail/wholesale distribution, and telecommunications. Together they comprise a niche — one that is rapidly approaching saturation. Until fault-tolerant vendors can provide tools or services to assist in migration of existing applications, growth will be limited to the traditional market niches.

— with Stephen L. Josselyn

LAN Servers: What are U.S. Users Buying, and Why?

Host system, budget pressures and corporate IS strategy have a major effect on LAN server purchase intentions, and commitment to client/server computing

Over the past several years, no computer industry movement has been deemed more important than "servers." The term "client/server computing" is equally widely used by information systems vendors and users in discussing their IT plans, visions and application architectures.

But what is "client/server computing?" What exactly is a server? Who's buying them? How many are they buying? And how can customers' interest be quantified to reflect servers' importance in the computer industry, and to computer vendors? These are some of the questions IDC addressed this past winter when it conducted its largest user survey ever.

A host of definitional problems cloud the process of gathering information about "*anything*-server." The terms "client/server computing" and "servers" mean many different things. Computers called servers are sold into a multitude of host environments. They run a dozen different operating systems. They provide solutions for another dozen different application bases. For good reasons, five industry experts would give five different definitions of server.

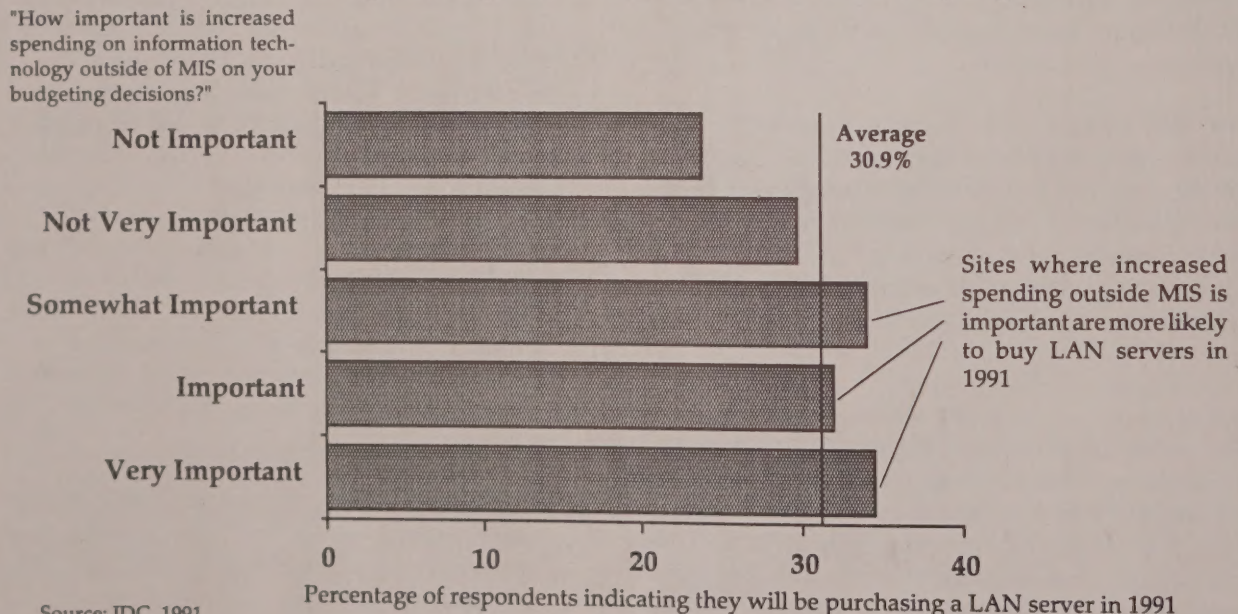
The intention of the server component of IDC's annual IT spending survey was to determine how servers fit into IT strategies, and to evaluate what external and internal factors have positive and negative influence on server purchase intentions. To reconcile the definitional haze, IDC chose to elicit attitudes towards the concept of client/server computing without defining the term. Respondents were asked a wide variety of server-oriented questions — from Will you buy LAN servers in 1991?" to "Describe your organization's attitude toward client/server computing ... ." Because of the difficulty of providing a single, coherent definition of "client/server computing," and "servers," this method allowed IDC to give respondents a great deal of freedom to define their organization feeling toward — and willingness to purchase — LAN servers. Among the key findings:

- Of the 1,500 sites, 21% indicated they already have moved, or currently are moving, to a client/server architecture. An additional 11% are planning to move.

- Approximately one-third of the 1,500 sites will purchase LAN servers in 1991. Three-quarters of those sites will buy only one or two servers.
- Of the sites, 47% are committed to downsizing. Some just aren't downsizing with a client/server architecture.
- Almost one-quarter of the 1,500 sites will purchase Intel-based servers. Less than 4% plan to buy a minicomputer-based server.
- Sites where IBM mainframes are the senior system are the most aggressive purchasers of LAN servers. Over 60% of IBM mainframe sites will buy servers in 1991.
- IBM AS/400 sites and Unix sites are least likely to buy a LAN server. Only 25% of each type of site will purchase a LAN server in 1991.
- Many respondents equate "downsizing" with the use of LAN servers. Of sites "strongly pursuing a downsizing strategy," over half will purchase LAN servers.
- Many sites indicate they have already chosen their client configuration. Sites that have standardized on DOS with Windows, OS/2, or Macintosh are much more likely than average to purchase LAN servers in 1991.
- Funds for server purchases appear to be coming from both capital equipment and PC components of respondents' IS budgets.
- Sites that are cutting PC, workstation and LAN budgets may not be cutting LAN server purchases.
- Approximately one-half of corporate MIS in the United States is committed to downsizing. But only 32% of them respond positively to client/server, and only 30% of them are buying servers.
- Downsizers are much more likely to be buying more servers. Apparently, attaching a PC to a minicomputer or mainframe — without a server — may actually mean "client/server" to 10% of respondents.
- The generally optimistic outlook for LAN servers is not likely to brighten the picture for minicomputer companies. Less than 4% of all respondents plan minicomputer-based LAN server purchases.

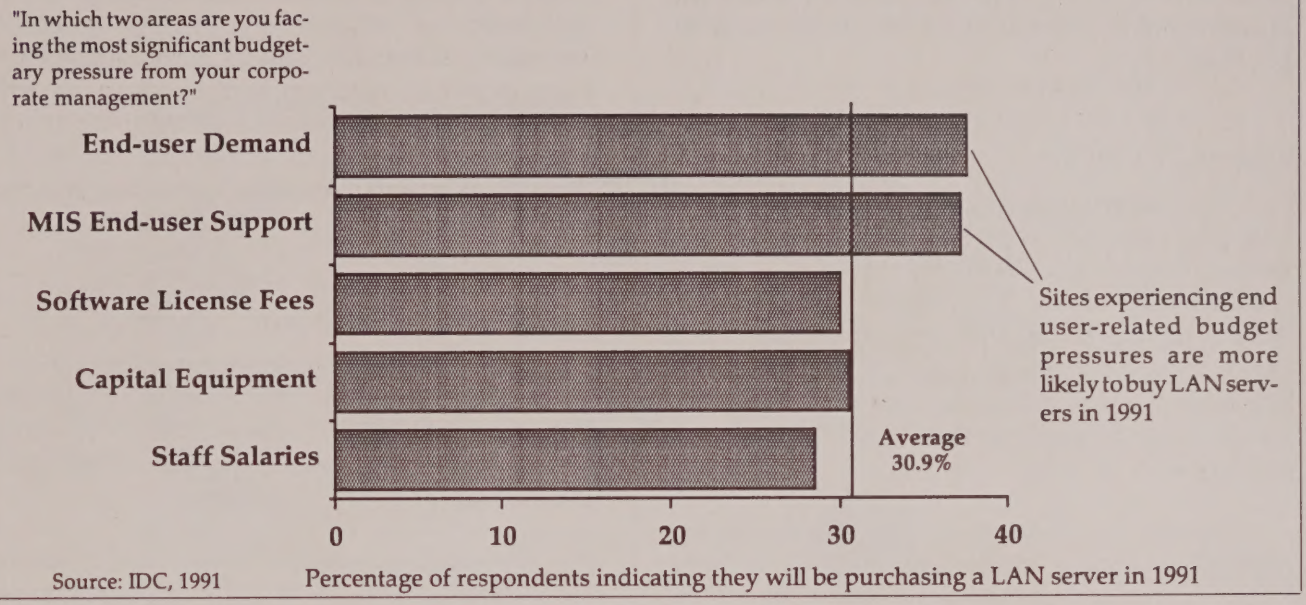
In order to determine what factors influence whether organizations will purchase LAN servers, IDC examined ten areas: type of senior system (see *CIR* 26:17), vertical market segment (see *CIR* 26:17), the organization's attitude toward downsizing , the organization's attitude toward client/server computing, type of application workload, attitude toward PCs (LAN penetration, unit growth, source of

Non-MIS Spending and LAN Servers: Who's Buying?


"How important is increased spending on information technology outside of MIS on your budgeting decisions?"
Not Important
Not Very Important
Somewhat Important
Important
Very Important
Average 30.9%
Sites where increased spending outside MIS is important are more likely to buy LAN servers in 1991
0
10
20
30
40
Percentage of respondents indicating they will be purchasing a LAN server in 1991

Source: IDC, 1991

Budget Pressure and Servers: End Users are Driving Purchases


"In which two areas are you facing the most significant budgetary pressure from your corporate management?"
End-user Demand
MIS End-user Support
Software License Fees
Capital Equipment
Staff Salaries
Average 30.9%
Sites experiencing end user-related budget pressures are more likely to buy LAN servers in 1991
0
10
20
30
40
Source: IDC, 1991
Percentage of respondents indicating they will be purchasing a LAN server in 1991

PCs, chosen OS standard, PC saturation levels), and MIS budget pressures.

Effect of IS Strategy

Organizations with clearly shaped plans to downsize or to implement a client/server computing strategy would be expected to purchase LAN servers in higher proportions than the general sample. However, because neither of those IS strategies has a single, clear definition, testing for their potential effect on server purchase intentions posed a vexing problem to IDC's analysts.

In the client/server definitional fog, perception is everything. IDC therefore chose in this survey to elicit attitudes toward the concept of client/server computing, downsizing, and LAN server purchase intentions without providing complete definitions. We felt this would help clients because it illustrates what users are thinking, with very little prodding.

In total, 31.7% of sites responded positively to client/server questions in the survey. And, in general, they are backing up their intentions to move to client/server computing with LAN server purchase intentions. Sites that are moving (41.0%), or are planning to move (43.2%) are much more likely than average (30.5%) to buy servers in 1991.

Respondent attitudes toward downsizing are similar. IDC posed the following question:

"In terms of downsizing applications away from your (site specific) hosts toward smaller platforms, is your organization strongly pursuing, gradually pursuing or not pursuing such a strategy at this time?"

In total, 16.0% of all respondents are strongly pursuing a downsizing strategy; 30.8% are gradually pursuing a downsizing strategy. Just over half — 53.2% of respondents — are not pursuing a downsizing strategy.

Downsizers are backing their stated strategies even more emphatically than believers in client/server computing. Over half (51.4%) of sites strongly pursuing a downsizing strategy will purchase LAN servers in 1991.

Attitude Toward PCs

Many of the 1,500 respondents appear to view client/server as a simple extension to their organization's PCs. Call it architecture by default. Their attitudes toward the need for more PCs in their organizations were mirrored in their intentions to buy LAN servers.

Sites that agreed with the statement that "the organization still needs many more PCs" are more likely (42.2%) to purchase servers than average (30.1%). They are more likely than average to to buy one server, and two to five servers, than average.

Sites disagreeing with the statement "the organization still needs many more PCs" are less likely (24.4%) than average to purchase servers. Sites that agreed with the statement that "we are essentially saturated. We are now in upgrade or replacement

mode" are less likely (26.2%) than average to purchase servers. Sites disagreeing with the statement are only slightly more likely (32.5%) than average to purchase servers.

Unit PC Growth

Sites expecting anything but slow growth in PC unit purchases are more likely to purchase LAN servers. Almost half (48.9%) of sites that expect a small decrease in unit PC purchases will buy LAN servers. However, less than one-quarter (23.9%) of sites that expect no change in unit PC purchases will buy LAN servers. An average number of (29.7%) sites that expect a small increase in unit PC purchases will buy LAN servers.

Sites with moderate to high PC unit growth are buying LAN servers. Almost one-half (44.1%) of sites expecting moderate growth (24-49%), 54.6% of sites expecting higher growth (50-74%) and 77.6% of sites expecting very high growth (75-99%) will buy LAN servers in 1991.

LAN Penetration

More than one LAN server vendor is hoping to cash in on the booming late-1980s LAN market. Indeed, sites where PCs are connected to a LAN — but which now need more horsepower — are natural prospects for LAN servers.

To estimate the size of this universe of prospects, IDC asked respondents what percentage of their PCs are currently on a LAN, and what percentage of their PCs will be on a LAN at the end of 1991. The average percentage of PCs on a LAN in 1990 is 27.1%, while respondents expect 39.8% of their PCs to be attached to a LAN at the end of 1991.

Not surprisingly, respondents with PCs on LANs in 1990 will aggressively buy servers in 1991. Only an average proportion of respondents with none of their PCs on LANs will buy servers in 1991. Respondents that expect to have PCs on LANs by yearend will be buying servers even more aggressively in 1991.

Effects of Recession

Respondents indicating that expectation of a recession was a very important budgeting factor are less likely (only 18.5%) than the average respondent (30.5%) to buy a server in 1991. Those that will buy, will buy fewer servers than average.

However, disregard for the effects of a recession did not directly translate to server purchases. Respondents that indicated that the expectation of a recession was not an important factor were no more likely to purchase servers than average. But while their overall numbers were fewer, those respondents with a moderately negative response (not very important), did expect to buy a higher number of servers than average.

Application Workload

Sites with a disproportionately high amount of technical-application processing are less likely to buy LAN servers in 1991. The proportion of commercial processing does not seem to predict the amount of planned server purchases for 1991.

Technical applications were found to account for an average of 17.3% of overall information processing workload. Sites where technical applications account for a larger proportion of overall information processing (over 35%) are less likely to buy servers in 1991. Sites where technical applications account for a smaller proportion of overall information processing (less than 10%) are far more likely to buy servers in 1991.

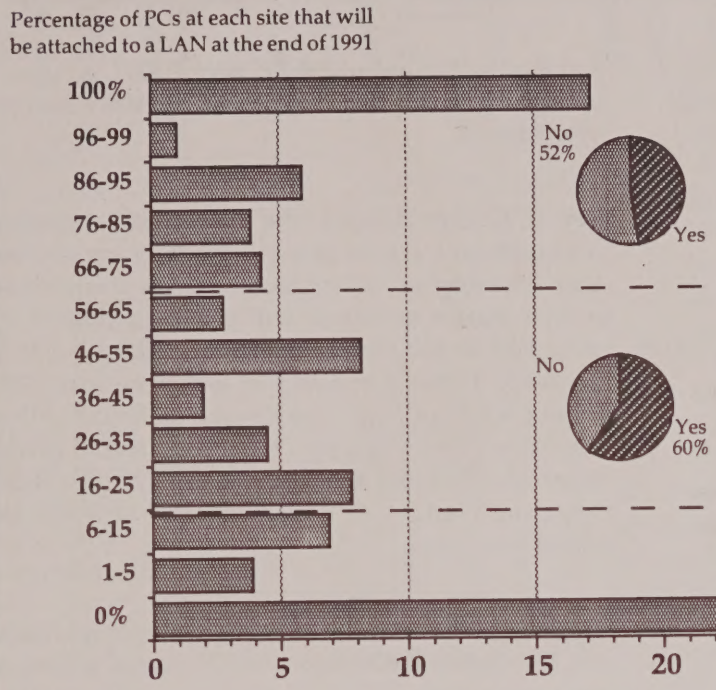
Budgeting Factors' Effect on 1991 Server Purchases

One force driving users to design and build IT systems around servers is cost. The plummeting price/performance of standard, microprocessor-based servers and networked PCs give more bang for the buck. It follows, then, that if systems comprised of workstations, PCs and LANs are technically able to provide the raw computing power of mainframes and minicomputers, users should cite very specific budget concerns which drive their LAN server purchase intentions.

In other words, when corporate management says "cut costs," we wanted to know whether sites would buy client/server. And the answer is, in general, yes they will. An inverse relationship exists between belief that corporate desire to control IS spending is an important budgeting factor, and server purchase intentions.

We measured six categories of budget pressures to determine their effect on each site's buying plans: current business performance, competitive pressure, corporate desire to control IS spending,

Percent of PCs on Networks and LAN Server Plans



Over 30% of all sites said none of their PCs were on a LAN. Virtually none of them have plans to purchase servers in 1991. As a result, 60% of sites will account for more than 95% of servers. Who's buying the most? Pie charts show responses — by PC-LAN attachment percentages — to the question "will site buy LAN servers in 1991?" Sites with between 16% and 65% of their PCs on a LAN are most likely to buy a LAN server in 1991.

Source: IDC, 1991

increased IS spending outside MIS, uncertainties regarding platforms and software, and other pressures.

Current business performance was rated by over 70% of respondents to be an important factor in its overall budgeting decisions. It was more important than any other budgeting factor by 20 percentage points. But current business performance is not a strong indicator of LAN server purchase intentions. Only a *slightly* higher-than-average number of respondents who thought current business performance was an important factor in their budgeting decisions actually planned server purchase in 1991.

On the other hand, perceived pressure from competition is a strong indication of intention to purchase a LAN server in 1991. Respondents may view LAN servers as a technology with which to catch, or stay ahead of, the competition.

Are corporate desires to control IT spending the driving force behind the popularity of client/server computing? No. But respondents seemed to be very aware of one basic reason for using a client/server architecture: it simply costs less.

How about spending outside of corporate management hierarchies? Sites indicating that increased spending outside MIS budgets was an important factor in their budgeting decisions are, expectedly, more likely to purchase servers than average.

While generally good news for LAN server vendors and distributors, servers are far more complex than PCs. And we may be seeing the beginning of an interesting intraorganization competition. PCs automated tasks that MIS never planned to automate. But servers have the potential to drain applications off MIS systems. That's real competition for MIS, where PCs were not.

Still, servers are not either purchased outside of MIS or not purchased. Everyone's buying them. The servers-through-the-back-door phenomenon received even greater credibility when we asked LAN server buyers which was more important: budget pressures resulting from demand from end users, or budget pressure from corporate management. But the questions also pointed out that servers are being purchased centrally, as well.

Sites that indicated high demand from end users for PCs, workstations and LANs, and sites that experienced pressure from corporate management to control MIS and end-user support expenses were both 7% more likely (than overall sites) — 37% to 30% — to purchase servers in 1991. Over 20% of those sites expect to buy two or more servers in 1991. Almost 5% of them expect to buy six or more servers.

Computer Industry News ... Computer Industry News ... Computer Industry News

Will any hardware companies be left on the East Coast of the U.S. in five years? Wang has announced a major strategy change — and the implications for MIPS, the VS (and hardware engineers in Massachusetts) are not good. Wang will stop designing and building hardware; instead it will resell IBM AS/400s and RS/6000s, and focus precious R&D dollars on imaging and office automation software. IBM will buy $25 million of Wang's debt instruments and could invest another $75 million. At heart, this is a Unix deal — not an AS/400 deal: Wang will port no software to the AS/400 and will only sell them in a last ditch effort to stem the flow away from VS (approximately 2,000 VS systems migrated away from Wang's base last year). Because Wang was already porting its OA and imaging software to two Unix bases — Intel multiuser PCs (SCO Unix) and OEM'd RISC systems from MIPS — its Unix strategy was already clear. Only now, the MIPS deal is dead; Wang will continue its SCO thrust on PS/2s running SCO — not AIX. Some Wang RS/6000 software should be out by yearend; the bulk will be ported by mid-1992. For its part, IBM gets access to Wang software technology, which may begin to fill holes in OfficeVision.

Unisys has sold networking subsidiary Timeplex to Swiss-based Ascom Holding AG and South African Mercedes Information Technologies to service a huge outstanding debt. Chairman James A. Unruh is refocusing the company on its bread and butter banking and financial markets. But if all you need is a good TP monitor, why make hardware?

Microsoft released DOS 5.0. It expects at least six million — and as many as 30 million — users may upgrade from earlier versions of MS-DOS. The new version runs faster and eases memory constraints while offering rudimentary help and shell functions. IBM, which sells its version of 5.0 for less than Microsoft, will release OS/2 later this year.

The NCR System 3000 will serve as the base platform for NCR/AT&T's future products. NCR dealers will sell the NCR 3120 notebook and AT&T CS dealers will sell both the 3120 and the CS Safari notebooks. Old AT&T 3B2s couldn't be eliminated altogether because of existing government contracts. NCR's Top End will support OLTP, and AT&T's Tuxedo will be marketed and supported by Unix System Laboratories.

Hey ACE. Some details of the Advanced Computing Environment's organizational structure are coming clear. The original specification, which was written by five charter members, will now be modified by consensus — the consensus of a few well-heeled ACE members. Those members that sell more than $200 million worth of hardware sit on a technical voting commitee. That's equality? In the midst of all the ACE hyperbole, IBM and Apple are talking GUI-for-RISC swap, and Wang — an ACE member — will soon be selling RS/6000s.

The bifurcation of PC distribution channels continues. Intelligent Electronics, which named a former manager of Toys "R" Us Canada to president of its new consumer retail group, belongs to the low-end, low-margin mass merchandiser category. A spate of merged, quasi-national chains that, generally speaking, are losing loads of money are trying to determine how they fit — along with smaller value-adders — at the high end. Most of the chains have been, at some time, guilty of lousy inventory management and planning. That will take a toll, particularly in the PC business.

Killer application? Imagine Inc., a Unix application developer, has cut the price of its Mediastation multimedia single-user software from $2,500 to $995. Just how elastic is the multimedia software market? If Mediastation pricing crosses the magic $195/seat barrier, maybe the *Gray Sheet* will ante up for the one NeXTstation in the office. And when Mediastation volumes rocket through the roof, might we witness a major reorganization of the nascent multimedia commercial workstation software market? The multimedia hype is ubiquitous. To hear some, Ada and LISP programmers everwhere soon will compile and debug in one window while wild horses gallop through another. K-Mart checkout clerks will chat with video images of the stockboy out back as they ring up socks and candy. This is a better interface? This is improving efficiency and productivity?We think not. Multimedia: the AI of the 90s?

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IBM and Apple Outline Plans to Cooperate in the 1990s

IBM has gained much, and Apple some, by signing a letter of intent outlining a broad set of hardware, software, and networking liaisons that might result in new products in two to three years. Execution details are sketchy. Consummating the definitive contracts, and the subsequent staffing of any new companies, are the most significant near-term challenges. Either way, the deal further clouds the PC desktop standards picture and may ultimately retard, not spur, industry growth. Some highlights:

- Apple and IBM agree to significant hardware, systems software, networking, and multimedia applications technology transfers.
- IBM appears to have licensed the RS/6000's POWER architecture to Motorola, who, in turn, appears to be able to sell it to other systems vendors. Apple intends to be among Motorola's first customers.
- Apple and IBM will create a jointly owned systems software company to develop and market a next-generation object-oriented-based operating system. Additional companies targeting multimedia may follow.
- Open systems marketing wars will become more confused and confusing. ACE, NeXT, and the 88K systems companies will be the most severely impacted participants in the near term.
- Increased fragmentation may not be good for longer-term industry growth.

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The announcement covered four main points:

- **Hardware.** IBM and Motorola "will use their expertise" to build a single-chip implementation of the RS/6000's POWER architecture, called "POWER PC." Motorola will sell POWER PC to both IBM and Apple, as well as to other interested vendors. Apple "intends" to use POWER PC in future Macintosh computers. The details of the arrangement between IBM and Motorola are uncertain.
- **Systems software.** The two companies will form a jointly owned, independently operated system software company chartered to develop a "new open-system software platform" based on object-oriented technology. The attempt likely will borrow heavily from existing Apple and IBM object-oriented development projects: "Pink," Apple's next-generation MacOS effort, and Patriot Partners, IBM's joint-development project with Metaphor. Both companies plan to use the end result in future product offerings capable of running MacOS, AIX, and OS/2 applications on Intel x86, Moto 68K, and POWER machines. The new company will be free to sell its wares on other vendors' platforms as well.
- **Networking.** IBM and Apple will jointly develop and market two classes of products intended to facilitate the adoption of the Macintosh into corporate environments. Networking products, such as IBM's APPN and perhaps Apple's AppleTalk, comprise the first class of products. The two companies also claim these deliverables will be jointly supported as well. An enhanced AIX that incorporates support for MacOS personal-productivity applications is the second class. The enhanced AIX will offer both OSF/Motif and Macintosh user interfaces.

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- **Applications software.** IBM and Apple "plan" to pursue common — and platform-independent — multimedia technologies.

Why Apple?

We believe Apple's motivations are basically four:

- Apple's heritage can be described as that of a systems software company that sold hardware to run its software. It feels its biggest long-run competitor is Microsoft, and it's probably correct. This arrangement allows Apple to keep being Apple by enabling it to position its proprietary systems software in a more "open" context.

- Apple gets access to critical IBM networking technology, thereby greatly simplifying the company's efforts to make stronger inroads into enterprisewide computing.

- By linking with IBM, Apple may be attempting to minimize its development costs and, very importantly, risks. In IBM, Apple has found a partner capable of underwriting the heavy fixed costs of system software development. But also, Apple can feel more secure as it pursues its goals. Not only are the direct costs of new development high, but the indirect costs of pursuing proprietary ends in a highly uncertain competitive environment could create huge strategic headaches. Marketeer Scully may find it easier to steer technology-driven Apple between a rock and a hard place if IBM is helping to clear the way.

- Apple may think the arrangement with IBM will increase its credibility in F1000 accounts as it continues its drive for market share.

Why IBM?

We believe IBM's motivations are basically five:

- IBM's heritage — whether desktop or data center — is based on differentiation. PS/2, OS/2, MicroChannel, etc. — all were initiatives aimed at making IBM more equal than the others. Yet pricing continues to dominate competition in the clone market. Because it has become clear that IBM can't do it alone, and because Microsoft seems intent on flexing its growing muscles, the company seems to feel that an arrangement with Apple will improve its differentiability. In other words, just as Apple wants to keep being Apple, IBM wants to keep being IBM.

- Systems Application Architecture (SAA) is not dead at IBM. It remains a crucial hub of the company's planning and coordination efforts. Yet the viability and success of SAA are very much tied to the success of OS/2 — IBM's OS/2, not Microsoft's OS/2. By combining with Apple, and promising a "supraplatform" development environment, IBM no doubt hopes to wrest any control Microsoft has gained over OS/2 through the ACE initiative.

- IBM has never demonstrated a strong end-user software capability, certainly not on the scale of an Apple. By partnering with Apple, IBM has access to a company that has consistently demonstrated an understanding of end-user interface requirements, desktop networking, and multimedia, and an ability to commercialize its technologies.

- The agreement with Apple may minimize IBM's legal exposure to the outcome of the Apple suit against Microsoft and HP.

- The current implementation of POWER comprises about 3.5 million transistors. By working with Motorola, IBM gains a partner with significant microprocessor design and manufacturing expertise, which should help the company's efforts to deliver POWER PC.

Challenges Facing IBM and Apple

By combining, can both IBM and Apple help each other keep being IBM and Apple — in other words, can they be both best friends and bitter enemies?

The two have a limited history of cooperation. This agreement, however, calls for the most complex

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form of cooperation — joint system software development. IBM and Microsoft both openly talk about the challenges they faced in developing OS/2, and they have had considerable experience dealing with each other.

There are no clues offered about funding, leadership, joint marketing, combined support — only an agreement that uses terms like "intend," "plan," or "expect" no less than eight times. The details of the arrangement are far from settled.

We believe that two near-term issues will provide critical clues about how well the two companies are likely to work together:

- The two companies must successfully consummate the letter of intent, establish the jointly owned companies, and begin working together at the development, grass roots level. These steps are supposed to be executed by the end of this year.

- Executing on the multimedia aspects becomes especially important since (1) both companies seem to feel these technologies are critical to generating market growth, and (2) this is the one area where neither company has to spend a lot of time explaining their pasts.

- The jointly owned entities need to be staffed by some highly skilled folks. They must be able to at once lead and execute highly complex development projects, and arbitrate the tensions between the Apple and IBM cultures. The success of this initiative in part hinges upon who is recruited to lead the charge.

Each will receive a crash course in the other's ways over the next few months. Currently, this is a very high-level announcement. The response of each company's rank-and-file, particularly Apple's, will be very important to the agreement's execution.

Growth Prospects

Combined, in 1990 the two companies captured 22.5% of the $67.6 billion worldwide desktop market. However, IBM, except for a good 1989, has seen its share steadily decline for the past few years. The company's overseas prospects are gloomier than here in the United States. IBM has recognized the need to take drastic action to bolster its worldwide competitive position in the desktop market.

Apple, meanwhile, has enjoyed the recent success of new low-end machines, but still hasn't made significant market share gains. Moreover, these machines do not generate the same type of margins as previous Macs. It is uncertain how long Apple could maintain its low-end momentum as larger numbers of software developers targeted other platforms. In any event, supporting huge R&D expenditures of the sort necessary to build next-generation Macs might have become problematic.

It is uncertain that this arrangement will necessarily increase the aggregate size of the market. The growth of the PC business in the 1980s was certainly driven by the fact that 85% of the market employed a common operating system. Further fragmentation, in fact, could slow growth considerably.

Thus, although both IBM and Apple seem to feel that their agreement might open up new growth markets like multimedia and the home, the reality could ultimately be that it only intensifies the fight for share in a market that is fast becoming dominated by industry uncertainties and slower growth.

—with Peter L. Burris and Pieter Hartsook

Is the Convergence of Computers and Communication Services an Illusion? Do Computer andTelephone Companies Compete? Should They? Will They?

When IBM bought ROLM in 1984 and part of MCI in 1986, there was talk of the convergence of the computer and communication industries. It sounded so good: the information age, an information *utility*, "compu-nication." But not for long. The convergence talk subsided when IBM quietly divested those assets after several unprofitable (ROLM) or not-profitable-enough (MCI) years. It sold off its share in MCI and spun off ROLM into a joint venture with Siemens.

The same convergence refrain has been heard again now that AT&T has picked up NCR. Only this time it's coming from a single boardroom on Madison Avenue in New York, lately joined (reluctantly) by one in Dayton, Ohio. What's to this convergence? Can computer companies sell telecommunications? *Should* they? Can phone companies sell computers? Should *they*? Can neither do both? Is there a huge untapped market out there for unknown products

created by the great convergence? Is it rational to legitimize a takeover by hoping an immature market will suddenly ripen?

Confusion reigns. The AT&T/NCR buyoff has been used as evidence by believers on both sides of the convergence discussion. Some still hold that telecommunication and computer markets are converging. Others insist they aren't. The debate rages: there is great synergy, there is none.

By almost any yardstick, telecommunications companies' forays into computer markets have been disastrous. Perhaps the best yardstick is their own backyard: a logical first step into the information age is the upgrading of the decades-old telephone network. But modernizing their single most important asset has been a problem. Telecommunications companies' expertise is still, predominantly, in analog voice markets. Consider the following:

- Voice communications in the U.S. public switched network (business and residential) was a $76.5 billion business in 1990. It is expected to grow at about 3% annually through 1995. The U.S. information processing industry was $110 billion in 1990. It is expected to grow at 6-7% annually.

- Switched voice service remains the principal source of carriers' revenue. It was approximately 88% of interexchange carriers' (IXCs: AT&T, etc.) 1990 revenue, and approximately 80% of local exchange carriers' (LECs: New York Telephone, e.g.) 1990 revenue. Growth also remains steady, at 4-5% annually.

- Revenue from digital private-line services in the U.S. totaled only $2.2 billion in 1990. It will, however, grow at about 16% annually through 1995.

- While revenue from specialized advanced communication services like integrated services digital network (ISDN), custom local area signaling service (CLASS), and switched multimegabit data service (SMDS) will almost double annually through 1995, it was tiny in 1990.

To date, telecommunications companies in the United States have generated only a little revenue, and not much excitement, in new data services. But not for a lack of trying. While investment in network upgrades — most notable in fiber optics — proceed at a snail's pace, the shackles of a muddled regulatory policy-by-default have hampered potential telecommunication innovators when they did propose something new.

Under current plans, a fiber-optic-based information network will not be available in the U.S. until 2040. Japan has set a goal of 2015 as to when its fiber network will be in place. This single fact — that Japan may leap ahead of the U.S. by 25 years in an industry that counts time in nanoseconds — may indeed bring policymakers, technocrats and business leaders together *(see page 7)*.

What benefits might accrue to the companies eager to press forward? We identify the following opportunities, among others:

- **New markets in consumer services.** A host of potentially promising, and as-yet unproven, consumer services may emerge into a real business opportunity. These include home electronic, voice messaging, and mail services; two-way video and image services; transaction services (home shopping); telecommuting; telemetry services (security alarms — "smart" houses); home health and human services delivery; and video on demand. Companies with expertise in both computers and communication services would be uniquely positioned to provide such services. IBM has, to its credit, made great strides with its Prodigy joint venture with Sears.

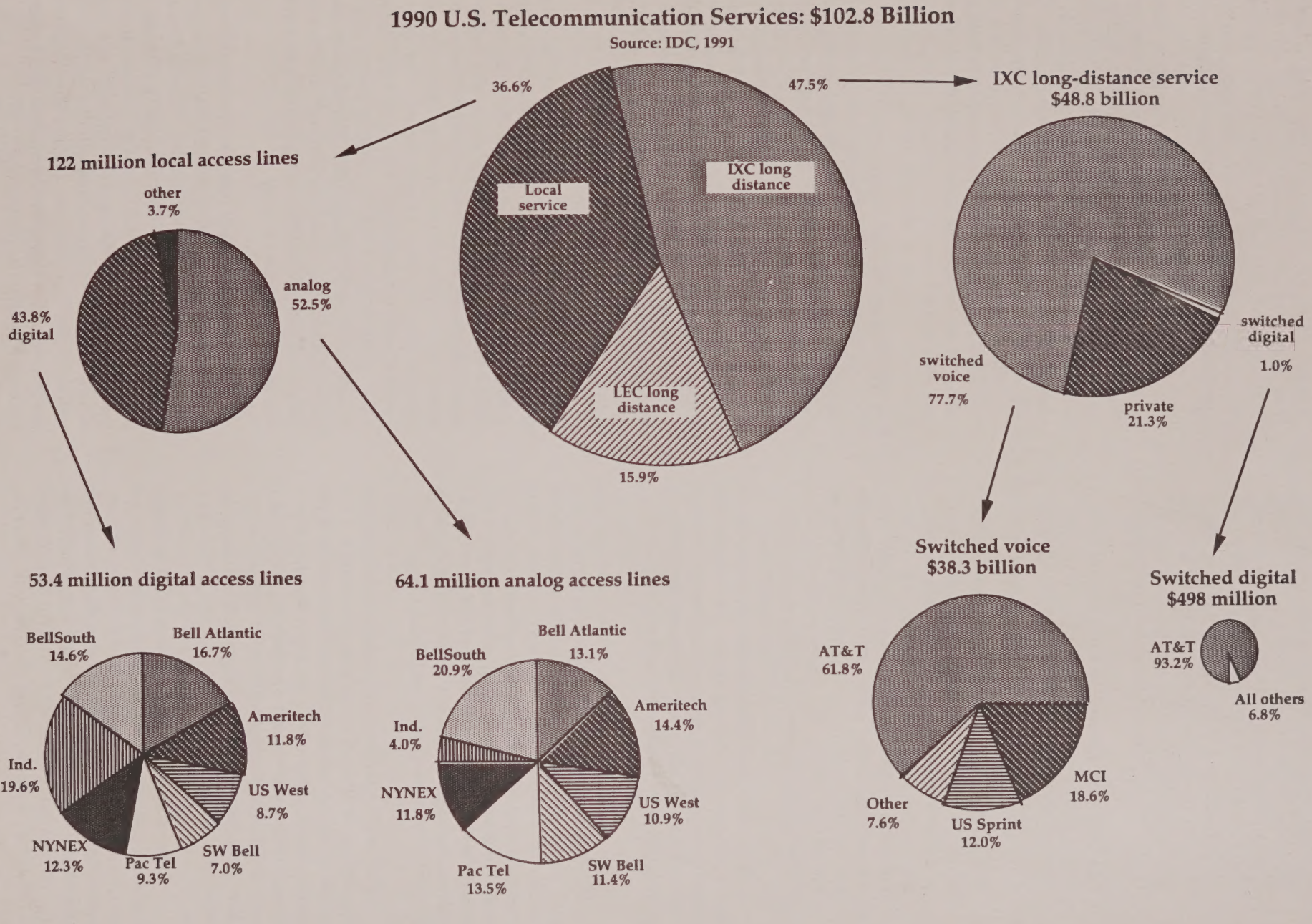
- **New markets in business services.** From fax to EDI, the potential market for new business communication services is undoubtedly huge. When ISDN and switched high-bandwidth services and equipment are designed and delivered seamlessly to MIS and telecom buyers concurrently, vendors may be able to tap new markets.

- **Scale economies.** In many ways, bigger is better: spread fixed cost over a broader base and you can charge less than the next guy.

However, a host of problems stand in the way:

- **User decision makers.** Users do not think about datacommunication the way they think about phone lines. Datacommunication users think about applications. But applications aren't sold by the telephone company.

- **Corporate culture.** AT&T never could sell computers. It's computer division lost billions over


1990 U.S. Telecommunication Services: $102.8 Billion
Source: IDC, 1991
36.6%
47.5%
IXC long-distance service
$48.8 billion
122 million local access lines
other
3.7%
analog
52.5%
43.8%
digital
Local
service
IXC long
distance
LEC long
distance
15.9%
switched
digital
1.0%
switched
voice
77.7%
private
21.3%
53.4 million digital access lines
64.1 million analog access lines
Switched voice
$38.3 billion
Switched digital
$498 million
BellSouth
14.6%
Bell Atlantic
16.7%
Ameritech
11.8%
US West
8.7%
SW Bell
7.0%
Pac Tel
9.3%
NYNEX
12.3%
Ind.
19.6%
Bell Atlantic
13.1%
BellSouth
20.9%
Ameritech
14.4%
Ind.
4.0%
NYNEX
11.8%
US West
10.9%
SW Bell
11.4%
Pac Tel
13.5%
AT&T
61.8%
MCI
18.6%
Other
7.6%
US Sprint
12.0%
AT&T
93.2%
All others
6.8%

the past six years. Neither could Nynex. It's Business Centers lost billions over five years before being sold to ComputerLand last month. The question is: Can these guys move beyond their traditional core businesses? Can they compete in unregulated markets? AT&T has sold a million customers on the "Universal" cards, but that's not information processing.

- **Lost focus.** NCR watchers are wary that NCR might fritter away its banking- and retail-systems expertise in order to save the sinking AT&T Computer Systems ship.

- **Regulatory considerations.** For the past 26 years the FCC has been attempting to deal with the convergence of computers and communication. It all started in 1966 when Western Electric announced it was going to be the information utility of the 1970s. Today Western is on the verge of bankruptcy, and the FCC has yet to resolve the policy problems that cloud the convergence issue.

If the network is the computer, why aren't more networking companies computer companies? The answer is equally simple: computer companies have to be networking companies, but networking companies don't have to be computer companies.

The relationship between the computer and communication industries is based on three important points. First is technology. The technological similarity between designing and manufacturing computer and communication hardware is undeniable. From a purely technological perspective, consumers and businesses alike benefit from reduced manufacturing and production costs. The technology sides of the businesses converged long ago.

Second is markets. Large portions of computer markets are facilitated by data communication. Conversely, some parts of communication markets are mediated by computer technology. But huge portions of each market have no underlying relationship to each other. Expecting any kind of convergence in them, other than the technological relationship defined above, is a mistake.

Even within those markets where customer demands and needs overlap, convergence does not necessarily mean companies in one segment can compete in another. Broad consumer market sectors like computers and communication are actually diverging. The needs of customers on the two distinct sides of the rift are not now, and most likely will never be, similar. They are not getting any closer. Further, computer markets are maturing. As growth slows, customer demands become more distinct, definable in more discrete elements. The ability to compete in specific niches — not broad sectors — is paramount.

The third and most essential relationship occurs at the customer level. Constructing finished goods that compute and communicate, and that customers will buy, demands that computer companies know how to build, integrate and manage networks. At the customer level convergence is occurring. Only, ideally, they won't know it. They'll just be gathering data off their "system." They won't know that "the system" is actually a hundred processors in a hundred different places running a hundred different operating systems.

Is the Network the Computer?

At the heart is the difference between information transmission and information processing. Each function carries a complex set of supporting and ancillary technical challenges. But they're different tasks. Compared to building useful computers, transmission of data is a more focused business based on switches bought from one of a handful of worldwide manufacturers. The information processing business is wholly different. At its core is the job of designing systems to fix organizations' information management problems. Then, it is assembling applications and building a reliable distribution system.

Yes, the network is the computer. So what? Constructing a solid and reliable transport environment is what the OSI model is all about. It exists to define interfaces — to say where and how information processing can leave off and transmission must begin. Why would a transmission company even want to learn the processing business? The convergence of core technologies in two industries does not create a compelling case for effecting such a radical modification of mix of business. Indeed, given such broad differences in customer demands, such a move is most certainly diversification rather than a complementary, synergistic strategy.

In this light, AT&T's motive was clearly business, not technology, management. Lacking the broad management systems that allow a General Electric Company, for example, to successfully compete in many different businesses, it bought it. Mastering the task of successfully managing global high-tech businesses in different industrial sectors is not an insignificant talent. It is, perhaps, far more important than the so-called convergence of computers and communication markets and industries.

LEC Commitment to Modernization: Unimpressive Despite Some Bright Spots

	Access Lines (Millions)	Digital (%)	ISDN (%)	CLASS (%)	Central Offices	Digital CO (%)	SS7 (%)	Fiber (K miles)
Ameritech	16.2	11.8	0.13	16.9	1,155	64.7	20.4	313.4
Bell Atlantic	17.5	16.7	0.04	24.8	1,335	71.9	53.5	449.3
BellSouth	13.2	19.6	0.02	43.4	1,655	56.8	46.3	469.8
NYNEX	15.0	12.3	0.09	8.0	1,293	70.7	15.6	447.9
Pacific Telesis	14.1	9.3	0.02	6.2	766	48.4	16.7	189.2
SW Bell	11.9	7.0	0.16	3.3	1,336	29.7	12.5	268.5
US West	12.6	8.7	0.12	3.3	1,715	32.8	9.5	301.8
Ind. telcos	21.6	14.0	0.02	1.6	5,580	77.9	11.5	249.2

Source: IDC, 1991

Breaking the Regulatory Logjam

Between Congress, the White House, the FCC and the Department of Justice, there's no wonder a regulatory logjam now exists. Each group has a different agenda, so nothing happens. It now appears, however, that the threat of falling behind other industrialized nations — i.e., Japan — may break the logjam. Here's what's happening on each of the major fronts.

The *Federal Communications Commission* is readying itself to take several large steps in policy development affecting the telecommunications and information industry and infrastructure development. These include:

- **A new and more definitive statement of Computer III.** This policy, which outlines how — and how much — information services can be delivered and sold by common carriers like RBOCs and IXCs, will be more comprehensive and thorough than its predecessors, meaning it will withstand higher court review. The FCC is doing it right this time.

- **Discussion of networks of the future.** FCC Chairman Alfred Sikes has initiated a discussion among prominent industry experts and users to develop policies that will foster — not inhibit — competition for local phone companies.

- **Breaks for the RBOCs.** With the threat that cable companies might actually introduce fiber to the home — rather than just complain about how expensive it is — RBOCs are unveiling plans to upgrade their networks. They're beginning to realize that if they don't install fiber to the home, someone else will. FCC-approved business breaks might include lifting line-of-business restrictions imposed upon RBOCs at divestiture.

- **Plans to give AT&T relief.** It will be allowed to compete more aggressively, while concurrently upgrading its long-haul network.

The *U.S. Congress* finally seems ready to enact telecommunications policy legislation. In the past five months it has:

- **Introduced legislation to reassign spectrum.** It reassigned 200MHz from the U.S. Government to private companies for new products and services.

- **Introduced legislation** to allow local telephone companies to enter the cable television business.

- **Passed a bill (in the Senate)** that will allow the RBOCs to manufacture equipment.

Even the *Executive branch* of the federal government is getting into the act; its policy will be outlined over the next 12 months. The basis of the policy is the freeing of RBOCs to enter new lines of business including manufacturing, the provision of information services, and the freeing of AT&T so it can compete more aggressively with Sprint and MCI.

State regulators may spoil any policy accord among the government policymaking environment. They — most notably California — were responsible for derailing Computer III. While there was some discussion of stripping states' telecommunication regulatory rights, the most recent bills introduced stipulate that cities and states will play a role in any future regulation of the cable TV business.

Information in this issue has been excerpted from the Computer Industry Report's sister newsletter, Telecom Insider, edited by Alan Pearce.

Computer Industry News ... Computer Industry News ... Computer Industry News

NCR announced the System 3125 notepad, as expected, with an August availability. It runs NCR's Pen OS, MS-DOS, Go Penpoint, and Microsoft Windows for pen operating systems. Tablet computing is heating up. NCR has leapfrogged Grid, Go and Microsoft have created a little drama with competing operating systems, and IBM has dropped broad hints that it will announce a pen computer soon. Estimates on the number of pen system announcements by yearend range from less than 10 to more than 30. The low end of that range seems most reasonable, given the significant differences between pen systems and more traditional computers. Japanese vendors, as well as unknowns such as Momenta and Tusk, might have the most interesting announcements. IBM has promised to move quickly. That means some time in 1992, most likely.

After five months of suspense, French microcomputer vendor SMT-Goupil has filed for bankruptcy. This time it may be down for the count. Goupil was revived in 1987 by a leveraged buyout by its employees.

Desktop and tower PCs based on the 50MHz 80486 Intel microprocessor were announced by about a dozen vendors at PC Expo in New York. The chip has a dhrystone rating of 41MIPS, a SPEC integer rating of 27.9, and a floating-point performance of 11.5 whetstone MIPS resulting in up to 50% faster performance than Intel's 33MHz 80486. The 50MHz 80486 is priced at $665 in volumes greater than 1,000 units.

Hewlett Packard announced new low-end and mid-level systems and servers based on submicron CMOS chip technology (PA-RISC 1.1). The new systems continue to leverage RISC across multiple platforms, enabling HP to maintain aggressive system price/performance, accelerate its product cycles, and offer profitable upgrade programs. The new systems effectively replace older HP-UX and MPE-XL systems (excluding the high end), and are positioned very competitively from a price/performance standpoint against IBM's AS/400s, RS/6000s, and DEC VAXs. HP will continue to outgrow the midrange market by a factor of two, based largely on the high double-digit growth rate of its Unix-based systems. Long-term success in midrange systems hinges on taking market share; with this announcement HP may gain share at the expense of DEC, and quite possibly IBM. HP will likely make a December/January announcement focusing on the high-end systems. It will probably announce SMP 980 and 870S kickers utilizing a faster clock speed approaching 90MHz. Unix shipments may lag MPE system shipments by one or two quarters due to OS factors. This will be followed by a four-way system in 2H92, which will incorporate a new uniprocessor probably using Hitachi's BiCMOS technology. The new uniprocessor should be four to five times more powerful than the current SMP systems, and will likely include a new I/O bus in the one gigabyte range. Six- and eight-way systems will follow in 1993 and may involve a GaAs implementation. Although the new HP systems offer very aggressive price/performance, both DEC and IBM are set to make announcements that could check HP's current lead. While IBM has had difficulties transitioning the RS/6000 to a three-chip set, we expect it to announce a low-end workstation for under $10K in September, and we believe DEC will announce low-end VAXs late in the fourth quarter.

Coalition bashers might not have the Hong Kong Multivendor Strategic Alliance to kick around much longer. Seven months after its formation— an initiative of the Hong Kong representatives of five multinational PC product makers aimed at promoting localized cross-vendor compatibility and support — the group has failed to expand its membership and has left industry observers wondering if the alliance still exists.

Both Sequent and Pyramid have had bad quarters. Sequent will lose "significantly" more than the $7 million it lost in the first quarter. It will de-emphasize OEM business, like Unisys, and focus on direct sales. Remember Arix? It was almost done in by a Unisys OEM deal, too. Pyramid announced last month that it may also be unprofitable for the quarter. What does this say about the Unix, high-end database engine market? Well, the market's still growing, but HP and DG are getting serious. Digital, IBM and Sun soon will be. It says: price bloodbath to follow. Or, make that "escalate."

IBM and Siemens will jointly produce IBM-designed 16 megabit DRAM chips in a converted IBM facility near Paris.

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Computer Industry
REPORT

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High-Performance Computing in the 1990s

High-performance computer markets are in flux. Replacement technologies are squeezing older designs into decline. Users are analyzing the purchase of multimillion-dollar installations with more scrutiny than ever. All around, competition between disparate suppliers — new and old, large and small, domestic and foreign — is keen:

- High-performance multiuser systems comprise five distinct markets: vector mainframes, supercomputers, minisupers, high-performance minicomputers, and parallel processing systems. Mainframes equipped with vector processing facilities accounted for over two-thirds of all revenue in the overall high-performance market in 1990, down significantly from 1989. Almost one-half of all vector mainframe shipments last year were IBM. Digital's vector VAX 9000 was very successful — accounting for almost one-quarter of all shipments. Some vendors are moving away from large systems (CDC) , others are focusing solely on commercial markets (Unisys).

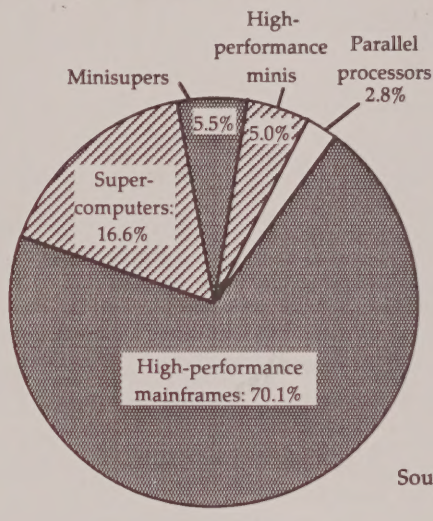
- Cray Research continues to lead the supercomputer segment with 84.1% of revenues, 72% of shipments and 62% of the worldwide installed base. But three strong Japanese suppliers will steadily gain share, particularly in Europe where they will not encounter stiff export controls or pricing and discounting regulation.

- Minisupercomputers continue to die a slow death, squeezed between RISC-based workstations and low-end supercomputers. Only three vendors remain: Convex, Alliant and FPS. None will have an easy go. Convex just reported its first-ever loss quarter. Alliant is still suffering from the recent transition to the i860, and FPS' SPARC story sounds good, but will be a challenge to pull off.

- Parallel processing markets are still more talk than action. Only 324 parallel processors were shipped last year, comprising less than 3% of worldwide high-performance computer revenue.

Intense price competition, pervasive use of t
"in the national interest" shibboleth, and the gro

Five High-Performance Market Segments Comprised $5.7 Billion Business in 1990



Source: IDC, 1991

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ing reliance on promises of "solution" selling (... what else is there?) are often the early signs of a maturing market. But, revenue from high-performance computer markets will grow at an admirable 9% over the next five years. That's not to say some high-performance segments haven't reached golden age. Minisupercomputers have. Other symptoms of maturity have as much to do with the unique constraints placed upon vendors selling in the emotional high-performance segment than either technology or the market.

Growth rates in high-performance market segments over the next five years will vary widely: vector mainframes at 5%, 12% for minisupercomputers and supercomputers, 19% for high-performance minicomputers and 37% for parallel processor systems.

Growth Prospects

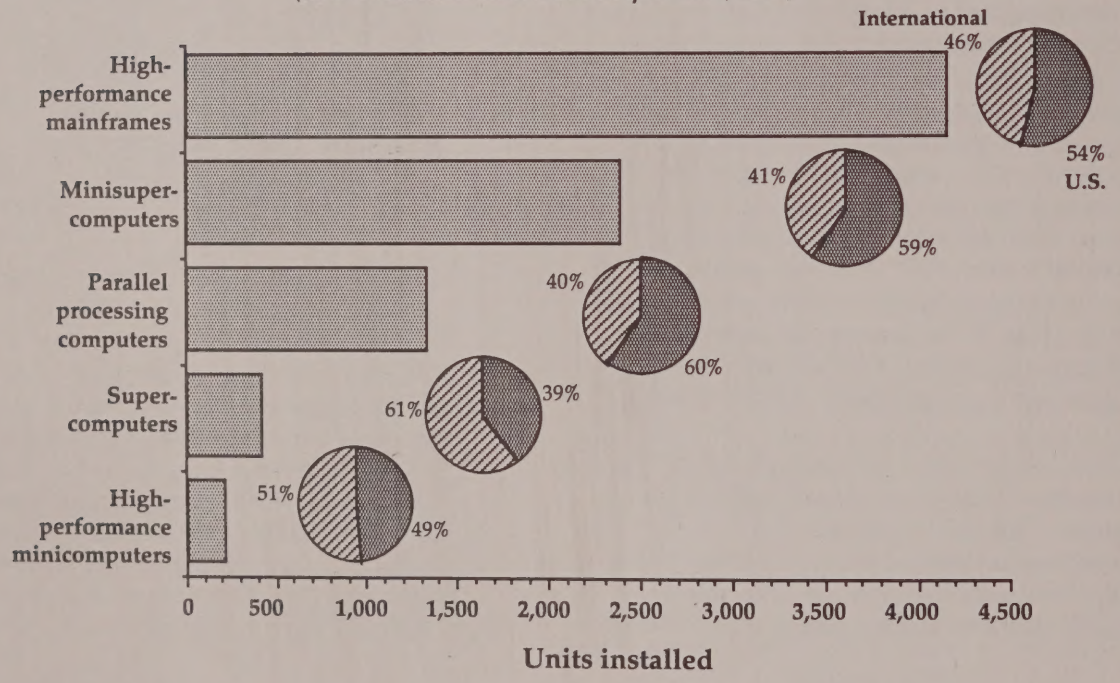
Growth in each market segment will be affected by changing demands for high-performance systems, including:

- **Time sharing.** It will be between $2-3 billion in 1991.

- **The commercial segment.** Commercial/industrial concerns have increasing need for high-performance computers. A host of competitive pressures — such as the increasing complexity of problem sets, time-to-market pressures, and the cost of failure — combine to make commercial markets huge growth opportunitiesfor high-performance vendors. In addition, commercial use of more-traditional applications — computational chemistry, molecular biology, earth resources, environmental sciences — are growing.

High-Performance Computers, 1990 Worldwide Installed Base

(Source: International Data Corporation, 1991)



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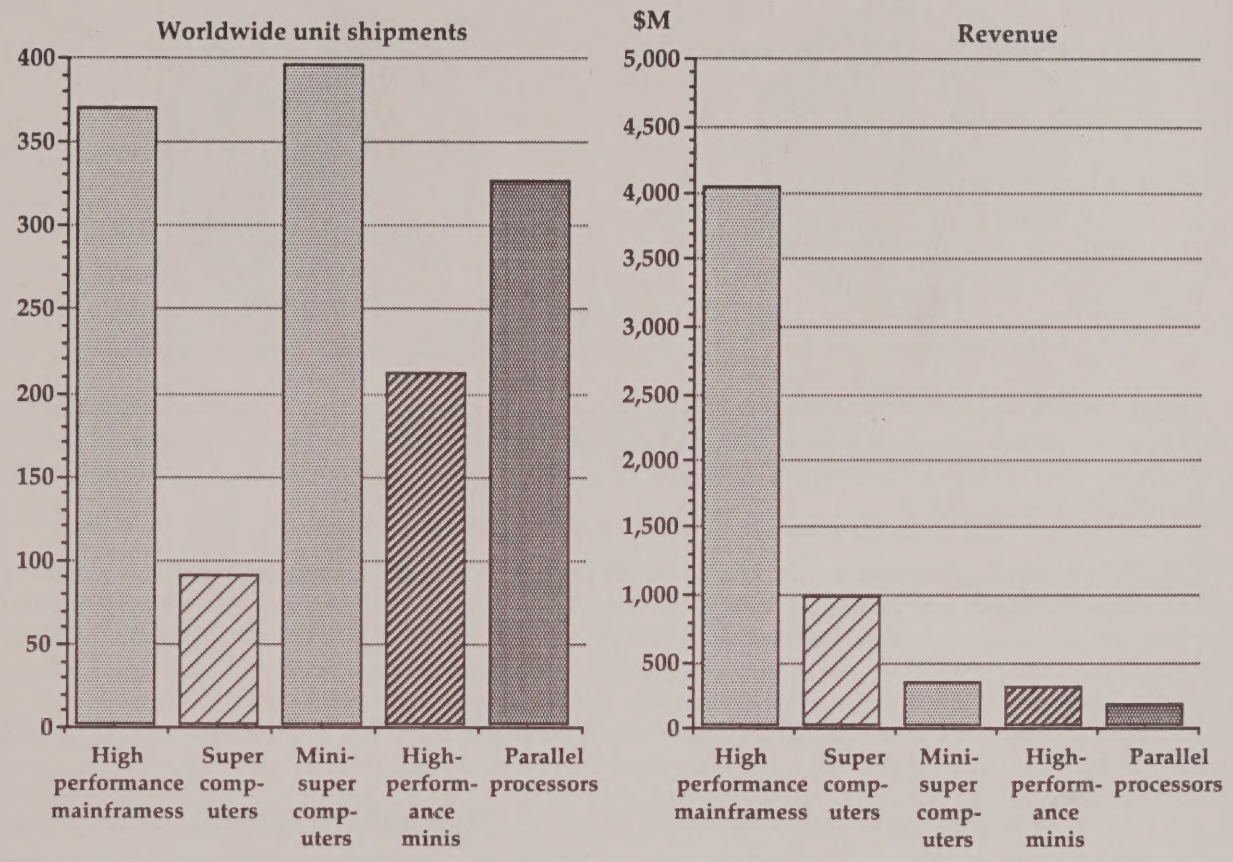
High-Performance Computers 1990 Worldwide Unit Shipments and Revenue

(Source: International Data Corporation, 1991)



We note the following factors affecting high-performance supply:

- The VAX 9000 will achieve volume shipments in 1991. It becomes a very formidable product at $1 million.

- IBM will become increasingly focused on the scientific/engineering market with enhancements to the high end of the ES/9000 family, a parallel visualization server, as well as continued emphasis on RS/6000 R&D.

- Japanese suppliers will be even more competitive in Japan, Europe and rest of world markets. Fujitsu will remain strongest.

- Convex, IBM and Cray Research will find intense competition in the $2-5 million range.

- Convex will be pressured on all fronts with the low end squeezed by workstations and the midrange by Cray Research. Short-term C3 rollout difficulties will make 1991 and 1992 difficult.

- Digital's and IBM's decision to provide vectors on their midrange products (VAX 6000 and air-frame ES/9000s) offering "nearly free supercomputing" will dampen minisupercomputer sales, most notably of the new Convex C3200 and C3400.

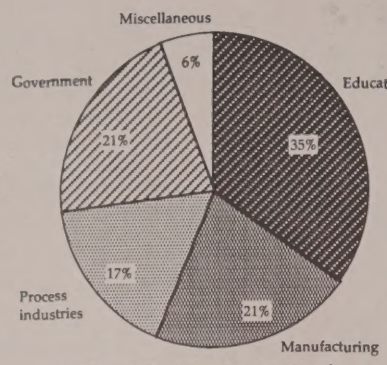
- Cray Research will feel growing pressure from domestic vendors (Cray Computer, Kendall Square, Convex, IBM and SSI), Japanese vendors and alternative architectures. Cray will enhance its product lines across the board, but will gain an increasing proportion of revenue in the midrange: the Y-MP2E and 4E.

- Cray Computer's 1991 introduction of the Cray-3 will not expand the traditional (technical) supercomputer market.

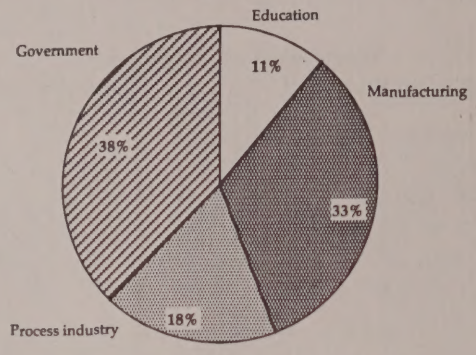
— with Debra S. Goldfarb

IBM and Cray Research Shipments by Vertical Markets

(Source: International Data Corporation, 1991)



IBM 1990 shipments: 180 units

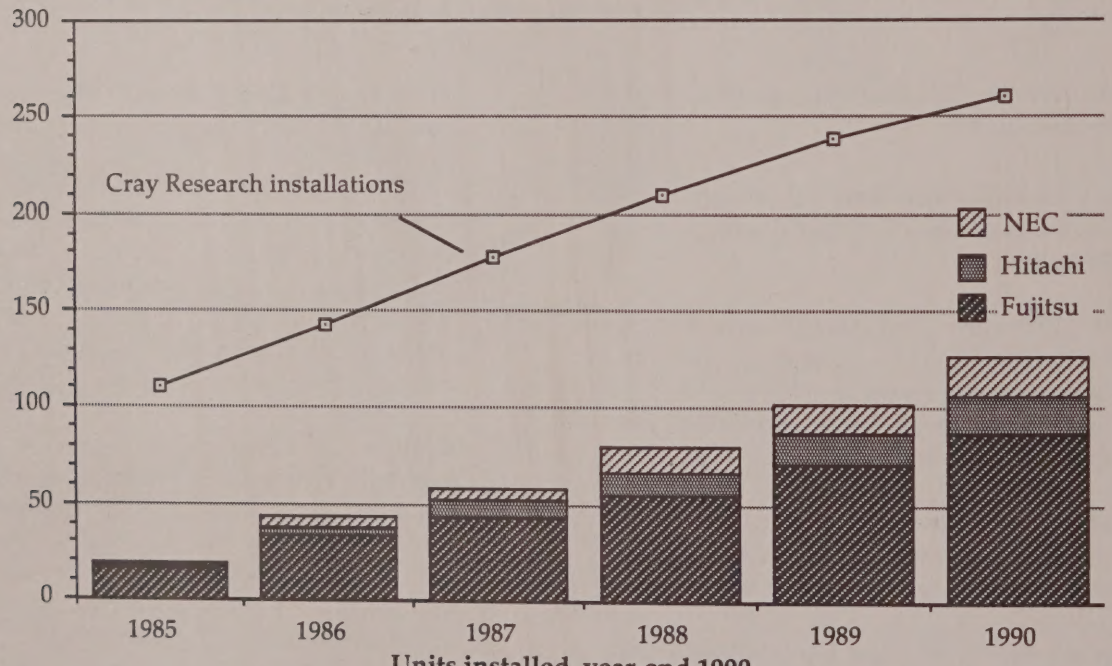


Cray Research 1990 shipments: 64 units

Where are all those IBM 3090/VFs going? Many high-performance computer vendors say they never see IBM in competitive situations. Nonetheless, IBM has sold loads of vector-equipped systems. We asked IBM where they all went. The pie chart, above left, shows IBM high-performance mainframe 1990 shipments by vertical group.

IBM is exceptionally strong in education markets. But its business in manufacturing markets may suffer. Cray Research, on the other hand (above right), derives fully one-third of its business from manufacturing industries and far less from education (where discounting is particularly vicious). IBM is either just trying to get a foot in the door at the big educational institutions, or Cray is shying back from the heavy price cuts. Or both.

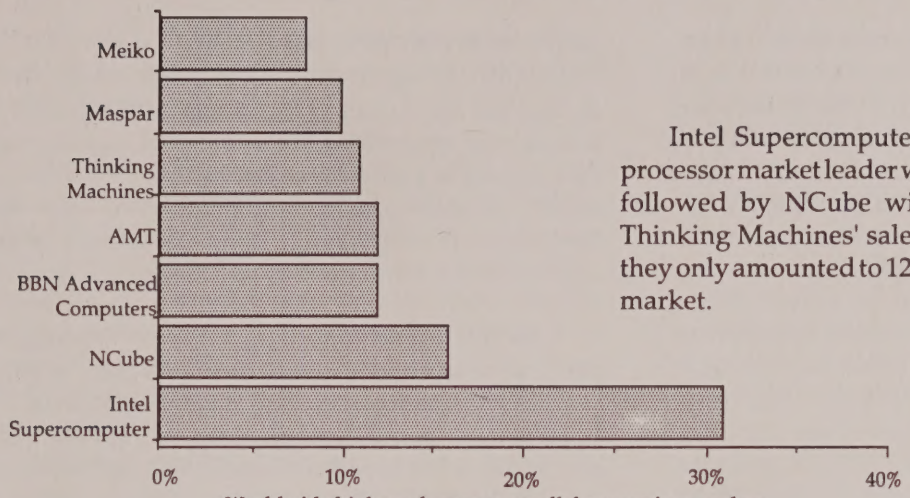
Cray Research's Installed Base Lead: Wide but Decreasing



Units installed, year-end 1990

Japanese high-performance computer vendors are coming on strong. Led by Fujitsu, Hitachi and NEC, they are threatening Cray's seemingly invincible (once, anyway) technological and installation lead.

High-End Parallel Processor Market Leaders

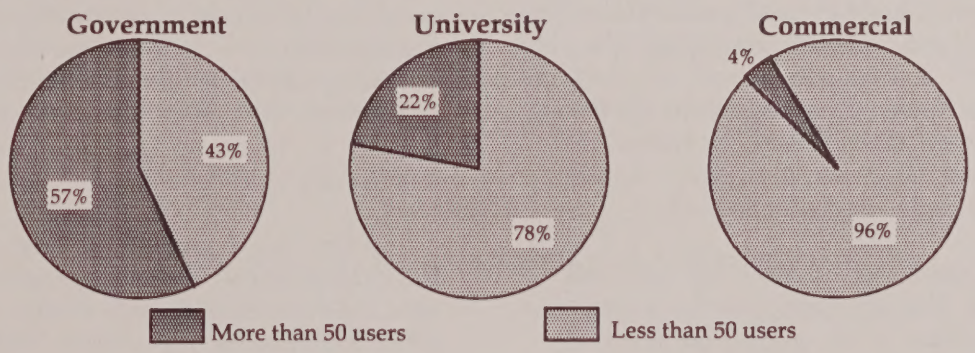


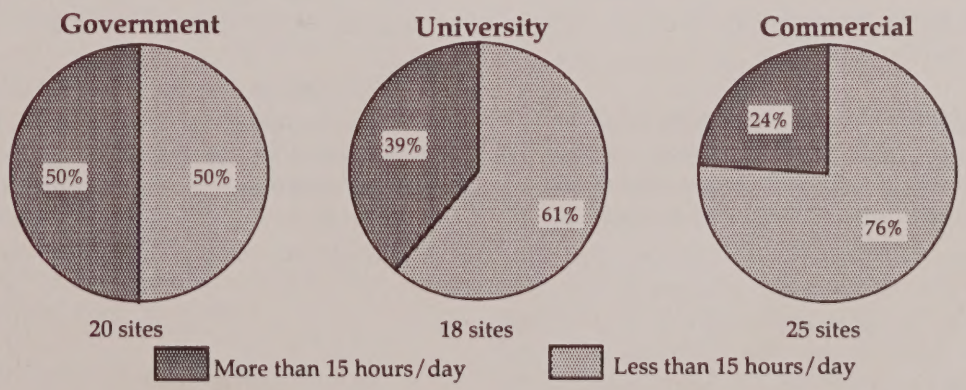
Worldwide high-performance parallel processing vendors share of shipments with ASV greater than $500,000

Intel Supercomputer is the high-end parallel processor market leader with over 30% of shipments, followed by NCube with just over 15%. All of Thinking Machines' sales were over $500,000, but they only amounted to 12% of the total over $500,000 market.

Parallel Penetration Still Low at Commercial Sites

One way of estimating the penetration of parallel processors into mainstream supercomputing applications is to examine their use at a variety of sites. The number of parallel processor users, and the length of daily operation, both indicate the degree to which parallel processors are becoming more like supercomputers, and less like novelties. Data from a recent IDC survey indicates that parallel processor penetration is proceeding slowly. Government sites, where supercomputers have been entrenched for years, and university sites, rely on their parallel processors much more than do commercial sites. Parallel processors at commercial sites are used by fewer people for fewer hours per day than either other type of site. They are still in the experimental stageand are far from running critical applications. And, perhaps, before we can start predicting that parallel processors are poised to replace other, simple vector-based high-performance computers, enormous advances in system, migration and application software are required.





Source: International Data Corporation, 1991

Taking Notes: IBM to Distribute Lotus Groupware and E-Mail

A cornerstone of hybrid computer/communication services (or is it products ... ?) is next-generation e-mail. Consolidation recently has wracked the maturing-but-still-young electronic messaging markets (see *CIR* 26:13, March 15, 1991). Now IBM and Lotus are teaming up and gathering around the most talked-about of the popular e-mail/groupware products, Lotus Notes.

IBM sales reps have been making excuses for OfficeVision/2 LAN for two years. And they still don't have a release date. That's just one reason why IBM and Lotus announced a broad agreement that will see IBM reselling Notes and cc:Mail, and the growth of further technology swaps between IBM and Lotus. Another reason is open APIs. With Notes technology becoming an important infrastructure to OfficeVision/2 LAN, IBM is taking another step toward making its proprietary systems more open.

The agreement is a relatively straightforward distribution and shared technology development effort. Some highlights:

- IBM's direct sales force will resell Lotus Notes and cc:Mail.
- The Notes distributed document database technology will be used in future releases of OfficeVision/2 LAN to handle unstructured information and backend group applications.
- IBM's three group communications applications products (OfficeVision/2, Notes, and cc:Mail) will all eventually use a common messaging engine and address book.
- Lotus has agreed to support OS/2 2.0 Workplace Shell. The OfficeVision desktop, one of the best features of the original product, will be moved away from the OfficeVision product to become more generally available as the workplace shell of OS/2 2.0.
- The companies have agreed to work together to develop common office protocols among the three products, a development effort that could reach fruition in the next 18 months.

Implications for IBM and Lotus

Notes brings to IBM not as much market share as mind share. Lotus has done an admirable job at selling and controlling the successful implementation of Notes, particularly among IBM's traditional office customers, the Fortune 100. In fact, Lotus and IBM have been competing, although OfficeVision 2 and Notes are hardly true equivalents.

Notes will no longer be considered the renegade product: sexy, sophisticated, yet unattached. Aligned with IBM, Notes suddenly adopts the demeanor of a legitimate product. Further, Notes is a product that works best with some tailoring. IBM is well-suited to provide a variety of professional services and consulting support.

In the long term, however, IBM will not be content to replace OfficeVision/2 LAN with Notes. Notes works well as an application running under the OfficeVision umbrella. But it does not perform the function of truly integrated office systems like HP's NewWave or NCR's Cooperation.

Competitive Implications

While this announcement is most certainly more than just a shot at Microsoft, the sting felt there must make the deal a bit sweeter for both IBM and Lotus. Microsoft's integrated office system strategy is weak, consisting of its suite of personal productivity products bundled with LAN-based e-mail. Microsoft has hinted about a Notes-like product, but none has been announced. This announcement will make it even tougher for Microsoft to establish such a product, particularly in IBM accounts.

Wang, too, emerges somewhat weakened. With this announcement IBM implies that it is truly focused on a Unix partnership with Wang, as we indicated (*CIR* 26:18 June 24, 1991). Wang will have to prove itself in Unix before IBM gives it a shot at anything more for IBM's office product line.

Kodak, on the other hand, must be happy. It and IBM have an existing agreement to jointly develop an image product for the PS/2. Because of Kodak's recent agreement with Lotus to jointly add image support to Notes, it is well-poised to become the ad hoc image supplier in the OfficeVision/2 LAN line.

— with Ann Palermo

Local Area Network Hardware: PC Network Interface Cards

Networking is hot. Local area networks are hottest. Over 33% of all PCs worldwide are now connected to a local area netowrk.

As increasing numbers of users and devices require access to LANs, demand for network interface cards (NICs) grows. Workstations, PCs, and multiuser systems are all attached to LANs through NICs. While the NIC market is at present experiencing strong growth, that will change within four to five years. The 1991 LAN NIC market is driven by these major trends:

- **Vendor crowding. Over 80 vendors worldwide now manufacture ethernet cards. Another 25 make token ring cards,** while a dozen still remain in the already-consolidating arcnet market.

- **Price erosion.** Intense competition is driving LAN NIC card prices down. The average price of an ethernet card dropped $55 over the past year to $270. Strong worldwide unit growth will be offset by dropping prices, so that by 1995, revenues will flatten completely.

- **Emergence of ethernet unshielded twisted pair.** Recent finalization of 10BaseT, the ethernet unshielded twisted-pair standard, has resulted in a frantic rush by vendors to rework old cards, or develop new ones, to fit the new standard. 10BaseT is the fastest growing portion of the fastest growing NIC technology.

- **Jittery token ring transition.** After a rough start (troubles with 16/4Mbps chipsets from TI during 1990 prompted user uncertainty), three-quarters of 1991 token ring sales will be new, switchable 16/4Mbps cards.

- **Market polarization.** Stratification of the PC NIC market is resulting in growth at both ends. At the high end, "smart cards" and 16-bit boards are targeted at LAN servers, 386s and 486s. At the low end, price-sensitive customers are looking toward technologies like arcnet and localtalk.

- **Integration of NICs into desktop devices.** With NIC prices soon dipping into the $100 range, a strong possibility exists that systems vendors will begin bundling NICs into motherboards. However, no one technology dominates PC networking, as ethernet does in workstation markets. And several media choices exist within each technology. PC vendors will be reluctant to provide an all-or-none networking choice, and network-ready PCs will not have a major impact on the PC NIC market until 1994.

The worldwide LAN hardware market — PC, workstation and multiuser system network interfaces — generated approximately $2.3 billion on 7.2 million units in 1990. The installed base of network interfaces grew to 19.7 million units. By 1995, the PC, workstation and multiuser system NIC market will grow to approximately 15 million untis annually, and the installed base for will grow to 68 million units.

— with Lee Doyle

Sun, Waiting on Superscalar Sparc, Cuts Prices

To answer the performance leadership of HP and IBM, Sun has made a lukewarm IPC follow-on announcement for its volume desktop platforms. Its "promotional pricing," however, keeps it competitive versus RISC workstations and DEC's 486. Sun is vulnerable long term, as it is waiting on superscalar chips from TI and Cypress to keep up in workstation price/performance, and its own multiprocessing technology for over-$50K servers. There are four components of the announcement:

- New IPX (IPC follow-on) integrates graphics, adds memory and 40MHz Sparc

- New ELC (SLC replacement) adds memory, 33MHz Sparc

- Promotional IPC pricing achieves color desktop for $6,995

- New 1.3GB IPI and SCSI disks and repricing of Sparcserver 470/90

Sun's traditional technical markets allowed it to set workstation price bands to its advantage, and kill off old products by bringing in new ones at existing price points. Now, with aggressive workstation performance coming from IBM and HP, and to penetrate commercial accounts, Sun is being forced to price against PCs. For the calendar year, Sun is offering an IPC with 16" color monitor, 8MB of memory, and 207MB disk for $6,995; $5,995 with a trade in.

continued next page

Computer Industry News ... Computer Industry News ... Computer Industry News

Three PC software mergers — two silly, one noteworthy — have been announced. IBM will buy Metaphor Computer Systems, Borland will buy Ashton-Tate, and Novell will buy Digital Research.

IBM's purchase of Metaphor is particularly compelling because it indicates how serious IBM is about object-oriented programming. In the wake of the Apple announcement, it means IBM isn't afraid to seek nonhomegrown management to run unwieldy joint ventures. That bodes well for the collaboration. David Liddle, our first pick after Steve Jobs to head IBM's end of the Apple collaboration, has been the most influential object-oriented speaker and seer for years.

The other ownership changes are rather pedestrian. Tate was a company on the decline, despite the heroic efforts which returned it to profitability last year. It could have been worse: bankruptcy was a possibility. Lingering dwindling market share, like that of Wordstar, is a pitiful sight. Bland assimilation into Computer Associates might possibly be worse.Being purchased by Borland, which will mark a severe exit from the PC software market, at least protects dBase users. There is some synergy. Both Borland and Tate will solidify their position in the PC database market. But buying the competition — at exorbitant rates — is an awkward way to get share. At least the acquisition preserves some of dBase's market presence by giving its cross-platform strategy a fighting chance.

Has the heady merger activity of the last weeks affected Novell? The Digital Research buyout was, to say the least, unexpected. In the best light, Novell gains access to Digital Research's solid, if not earth-shattering, systems technology. It seems logical that Novell will resell DR DOS. Additionally, Novell might make the case DR systems software gives Novell more control over both server and client ends of future products, should IBM and/or Microsoft become even more domineering. It's expensive insurance, with little apparent payoff. And while Netware is strong in its market, DR DOS has little influence on the PC operating system market, despite success in embedded systems markets. If Novell really does plan to pursue tightly-integrated client/server market, it needs applications; it gains few from this merger.

The long wait is over for NEC. It received the go-ahead from France and signed an agreement with Groupe Bull to exchange its 15% interest in U.S.-based Bull HN Information Systems Inc. for a 4.7% stake in Groupe Bull's parent, Compagnie des Machines Bull. In an abrupt about-face, Foreign Minister Mme Cresson insisted at the end that she had never actually opposed the deal, but only wanted to raise some important questions. Anticlimactically, the deal doesn't change much. NEC succeeds in firming its distribution channels in Europe, but it will probably not have any great influence in making major policy changes, or even minor steering decisions. Bull gains some top-level management acumen and an even more global perspective. Question: will it listen?

Meanwhile, the European Commission has opened a formal investigation into the planned $1.07 billion in French government subsidies planned for the Bull parent company. The commission has given the French government two months in which to provide details about the aid and the planned restructuring of the company, which has been suffering major losses since 1989. Answer: it may have to.

Sogeti, the French holding company that controls Cap Gemini Sogeti and Gemini Consulting Group, is negotiating to sell a 34% stake in German automotive and aerospace group, Daimler-Benz.

Sun, cont.

Likewise, on the server side, Sun has had less-than-expected success with its overpriced and underpowered 470 and 490, and is responding by cutting IPI storage pricing by 22% and introducing aggressively priced new 1.3GB disks. Sun could afford to be less aggressive on pricing if it introduced new storage technology earlier, and is currently leaving unnecessary money on the table for third-party add-ons.

Sun is still strong in Unix low-end servers and commercial desktops, but is beginning to look vulnerable in its core technical markets. HP and IBM may increase their performance lead. Look for high-end servers later this year that will add incremental revenues for Sun, if not making it a full-range database engine supplier. Sun's transition to superscalar chips, V.4, and multiprocessing, a three-pronged effort that could prove extremely difficult to manage — particularly simultaneously — remains critical.

— with Nancy Battey and David Card

Mainframe Review and Forecast

THE GRAY SHEET

Computer Industry REPORT

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Large-Scale Systems: No Summit Spike in '91 or '92

Neither product cycle-related buying activity nor a hoped-for worldwide economic recovery will ameliorate a flat (units) to slow-growth (revenue) outlook for large-scale computer systems through 1995. Aging products, combined with user tendencies to purchase fewer, but larger, systems, pushed unit shipments in the 1990 worldwide large-systems market down about 17%. Looking forward, mainframe MIPS and revenue growth will both climb slowly through the middle of the decade. Large-scale system revenues will grow 1.4% in the U.S. for the next five years (compounded annually) and 6.5% worldwide. Worldwide large-scale system unit-shipment growth will languish around 3-5% over that period after the precipitous '90-'91 drop.

Although new-technology mainframes will spur growth in 1992, the Summit era will more closely resemble the 3090's moderate expansion, rather than the sharp revenue growth spikes of previous mainframe generations. Consolidation will push average selling values up, and the installed base in the U.S. will actually contract. Several key market assumptions determine IDC's projected large-scale systems market growth for the next five years:

- Uncertain economic conditions in the U.S. and Europe for the remainder of 1991 will contribute to negative U.S. market growth in the short term. This will be offset by higher growth rates in Japan leading to flat worldwide revenue growth in '91. Projections for '92 indicate a recovery.

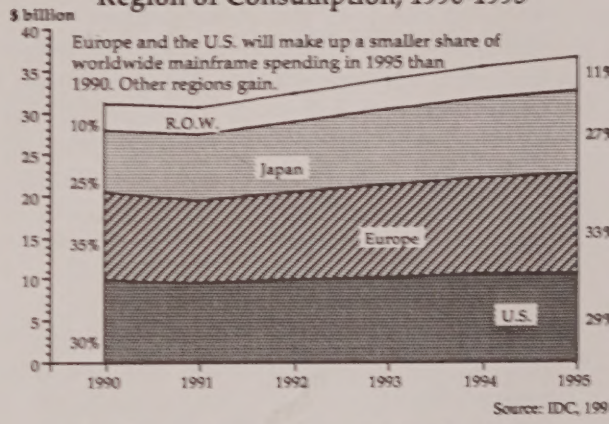
- Large-scale system customers are still in evaluation mode for IBM's new S/390 family of processors, which is delaying purchase decisions for the short term.

- Product life-cycle effects are diminished and customer assets are protected by the upgrade capability within all large-scale vendor product offerings. However, high-end system revenue is under pressure, due to the incremental nature of upgrades as opposed to new machine purchases.

- Based on an analysis of U.S. large-systems revenue versus capital expenditures, mainframe investment as a productive use of capital is less desirable than in previous years. This will lead to lower growth rates than in previous years for large-scale systems in the 1990s.

- The airframe S/390, or ES/9000 9121, is expected to be popular for 4381 customers looking for growth potential. Some low-end 3090

Large-Scale System Spending by Region of Consumption, 1990-1995



Source: IDC, 199

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and 308X customers may migrate to the 9121 to take advantage of improved environmentals. IDC has classified the 9121 as a medium- scale system; therefore, migration by 3090 and 308X customers will affect the large-scale market.

- Consolidation of application processing from multiple low-end mainframes to single high-end S/370 and S/390 platforms will continue to occur.

- High-end peripheral revenue will come under negative pressure due to increased competition for IBM's 3390 DASD from Hitachi Data Systems and Amdahl in 1991. IBM will probably introduce an enhanced version of the 3390 in late 1991 which could increase demand into 1992, a growth year for DASD. However, uncertainty created by the introduction of StorageTek's "Iceberg" disk array product (expected announcement in early '92) could soften the 3390 market while customers evaluate its viability and go to the secondary market for incremental capacity.

- Supercomputers will outpace the commercial large-system market, growing at a 12% rate worldwide.

Altogether, multiuser computer markets will show slow growth over the next five years: the entire U.S. computer hardware market will face less than 3% annual growth in value for the next five years, as multiuser systems will be flat and PCs will slow to 5%. In fact, IDC is expecting negative growth in the U.S. hardware market in 1991 — for the first time since 1975.

Large-scale systems are no different. Unit shipments may never again reach 1989 levels. The mainframe marketplace is being driven less by vendors' capabilities to deliver new technologies, and more by users' capabilities to absorb new technologies. Customer adoption barriers — including technology, organizational issues, applications, and financial issues — are emerging as the primary determinants of, or barriers to, growth.

Product Cycles and Mainframe Upgrades

Typically, the mainframe market takes off a year or so after a major IBM announcement. In 1992, however, as IBM and competitors increase the range of offerings and as customer uncertainties fall, we do not expect a product cycle revenue spike. The cause: changing dynamics in the mainframe marketplace.

Last September we called IBM's ES/9000 rollout "well-conceived and executed." The two-tiered, new-skin old-technology approach seemed a way of achieving IBM's objective: giving customers a palpable feel of the next-generation future (and stalling PCM purchases) while concurrently providing them with a smoother upgrade path to the new technology due out this year. It sounded good then, both for IBM customers and IBM.

It still does. But the strategy appears a victim of its own strength. With the days of wild mainframe expansion gone, mainframers must try something new. For IBM, that means adjusting the concept of upgrade to apply across mainframe families, *not just within* families. The "bridge and grow" strategy has crossed generational boundaries. The brick wall that separated systems like the 308X and 3090 is gone. Case in point: over half of all of IBM's 1990 hardware revenues (admittedly, across all sizes) is from upgrade business.

There's more. While IBM is trying to sell the upgrade strategy it is also trying to change the rules of the game. In attempts to solidify its influence in big accounts, IBM is trying to play off customers' uncertainty about PCM viability, and lock customers into S/390 as fast as possible. Are we getting a glimpse of the future of mainframe product-family introductions? Maybe. In fact, most certainly. But (and as a result) the impressive revenue spike that followed the early-80s introduction of the 308Xs will not be repeated.

That's not to say the announcement has been a flop. Sure, the 9000 rollout might have worked better in another day and age, perhaps when there wasn't

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1990 Leading Worldwide Large-Scale System Vendors

(Value of shipments, $ million)

	1989	89-90 Growth	1990	1990 Share
IBM	15,640	3.6	16,200	53.2
Fujitsu	2,260	11.5	2,520	8.3
Hitachi	1,910	11.0	2,120	7.0
Unisys & NUL	2,050	-5.4	1,940	6.4
Amdahl	1,720	-1.2	1,700	5.6
HDS	710	11.3	790	2.6
Groupe Bull	660	12.1	740	2.4
Comparex	530	35.8	720	2.4
Cray	590	8.5	640	2.1
NEC	570	1.8	580	1.9
Siemens/Nixdorf	550	-1.8	540	1.8
Digital	0	NA	420	1.4
ICL	280	25.0	350	1.1
Control Data	320	-12.5	280	0.9
Tandem	70	185.7	200	0.7
Others	790	-11.4	700	2.3
Total	28,650	6.2	30,440	

Source: IDC, 1991

such a plethora of viable substitutes. Or, when PCMs weren't cloning IBM functionality so quickly. The presence of able PCM competition (now faster than IBM customers — which is fast enough) is largely responsible for muting the announcement fanfare. But site control is difficult to quantify. And if IBM has bought some time and prevented even a small portion of its customers from looking — buying — elsewhere, it has done well.

Upgradability is a double-edged sword. By ensuring that current-minus-one, and in some cases current-minus-two, technology remains viable, IBM is protecting customer investments. But it is also forced to compete with an increasingly vigorous used equipment market. Without clear differentiation between new and used, price/performance points on new equipment are strongly influenced by pricing in the used market.

Mainframe complexity gets worse before it gets better. The architectural visions espoused by IBM — AD/Cycle, SystemView, and Sysplex — promise productivity benefits. But there remains a great deal of uncertainty about delivery schedules, financial commitments required, and ultimate impacts on existing installations. Meanwhile DASD competition is heightening, effectively lowering prices faster than it increases demand. Last year, strong demand coupled with high prices for IBM's 3390 DASD supported the slack market for processors. In 1991, pricing will come under pressure as Amdahl and Hitachi Data Systems begin shipping 3390-class devices.

Large Systems Market Share and the 1990 Environment

Aging product and user tendencies to purchase fewer but larger systems pushed unit shipments in the 1990 worldwide large-system market down about 17%. However, more expensive systems and a very strong DASD market enabled worldwide large-system revenue to grow 6% to a total of $30.4 billion. From both a unit and a revenue standpoint, business was considerably slower in the U.S. than overseas.

Against a backdrop of expectations surrounding IBM's September ES/9000 announcement, site consolidation, and Japanese aggressiveness and success, system pricing came under extreme pressure worldwide. In the United States, discounts for some vendors' products reached over 40%. Additionally, both Digital and Tandem shouldered into the mainframe arena, leading to a restructuring of both unit shipment and revenue market shares.

(continued p. 8)

Large-Scale Systems Market

	Number of Systems Shipped	Cumulative Number in Use	$ Million Value
	United States		
1985	1,610	11,080	9,290
1986	1,690	11,910	8,880
1987	1,680	11,710	9,070
1988	1,520	11,300	9,330
1989	1,390	10,870	9,420
1990	**1,170**	**10,500**	**9,820**
1991	1,050	10,150	9,500
1992	1,100	9,900	9,900
1993	1,120	9,750	10,100
1994	1,130	9,700	10,400
1995	1,150	9,700	10,500
	Outside the U.S.		
1985	2,060	9,780	10,390
1986	2,390	11,170	13,140
1987	2,780	12,610	15,590
1988	2,860	14,580	18,900
1989	2,850	15,550	19,230
1990	**2,350**	**15,950**	**20,620**
1991	2,470	16,480	21,000
1992	2,610	16,770	22,560
1993	2,790	17,140	24,170
1994	2,950	17,500	25,640
1995	3,030	17,760	26,790
	Worldwide		
1985	3,670	20,860	19,680
1986	4,080	23,080	22,020
1987	4,460	24,320	24,660
1988	4,380	25,880	28,230
1989	4,240	26,420	28,650
1990	**3,520**	**26,450**	**30,440**
1991	3,520	26,630	30,500
1992	3,710	26,670	32,460
1993	3,910	26,890	34,270
1994	4,080	27,200	36,040
1995	4,180	27,460	37,290

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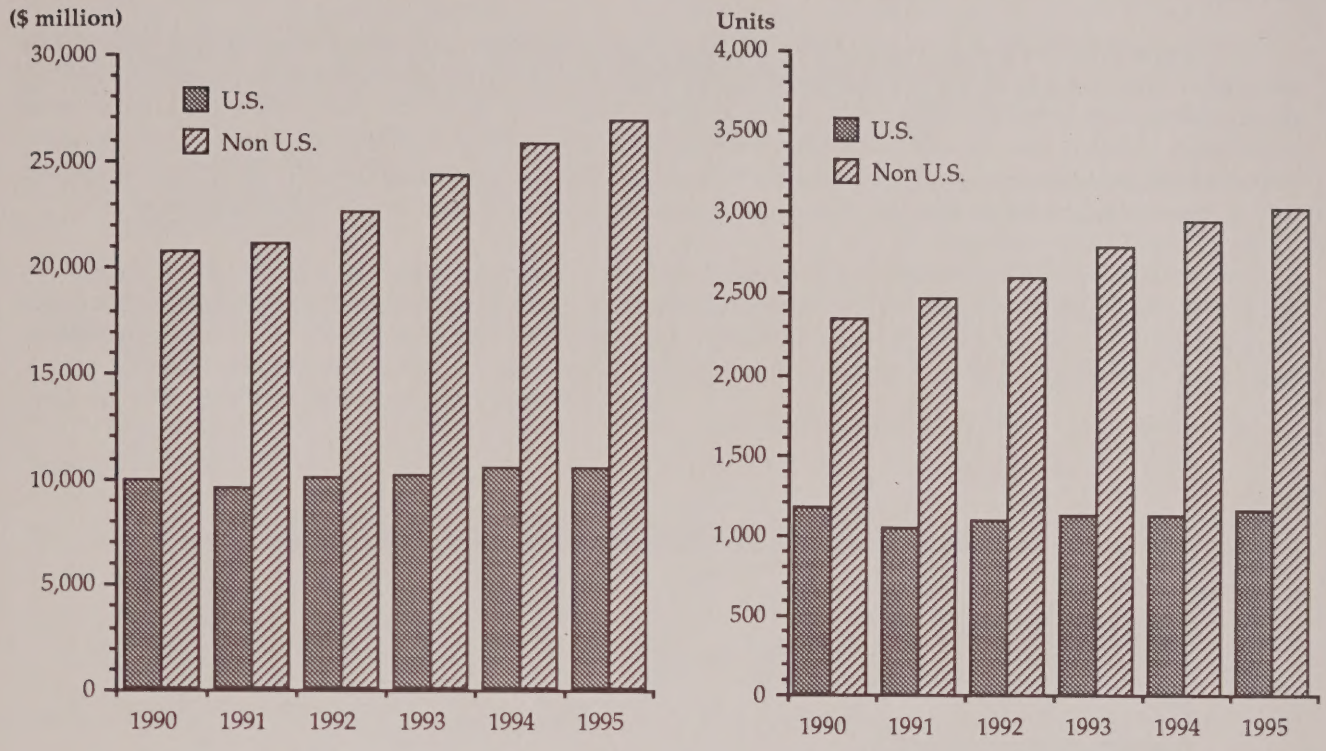
Mainframe Growth Will Come From Non-U.S. Markets

Large-Scale Systems Revenue and Unit Shipments, 1990-1995



Source: IDC, 1991

Japan's Mainframe Expertise May Drive Industry Growth

The future of mainframe competition may well depend upon what's happening in Japan. Japanese vendors are proving they can build competitive proprietary and PCM systems as quickly as any vendor worldwide. And soon the country may spend as much on mainframes as any other major region (see chart, p.1).

Japan has always been a disproportionately strong mainframe market. The highly centralized nature of Japanese business management, coupled with the hierarchical relationship between Japanese firms and their subsidiaries have lead to a predisposition to purchase mainframes. Downsizing has largely been, until perhaps very recently, a non-event.

As a result, Fujitsu and Hitachi thrive selling proprietary mainframes in their home country. Fujitsu's large-scale system revenue in Japan grew an unheard of (these days) 20% in 1990. Their dominance of Japanese markets translates into 8.3% (Fujitsu) and 7.0% (Hitachi) share of worldwide mainframe spending. And that's without their plug-compatible manufacturer (PCM) OEM business. The Japanese mainframers are consolidating their grip on the PCM market. The two biggest PCMs, Amdahl and HDS, are in part owned by Fujitsu and Hitachi, respectively. While Amdahl lost market share in 1990, HDS almost doubled overall mainframe market growth. Expect a smoother and greater transfer of technology and expertise between the two lines of business in the coming years.

Meanwhile, IBM is losing ground in Japan. IBM Japan had a disappointing 1990 and 1991 may be no better. IBM Japan spent much of the 1980s focusing on its traditional core strengths: banking and financial markets. Now that reliance may be a problem. The same ES/9000 lag that affected worldwide markets is stifling IBM Japan, too.

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A Summit Retrospective and IBM's Fourth Quarter

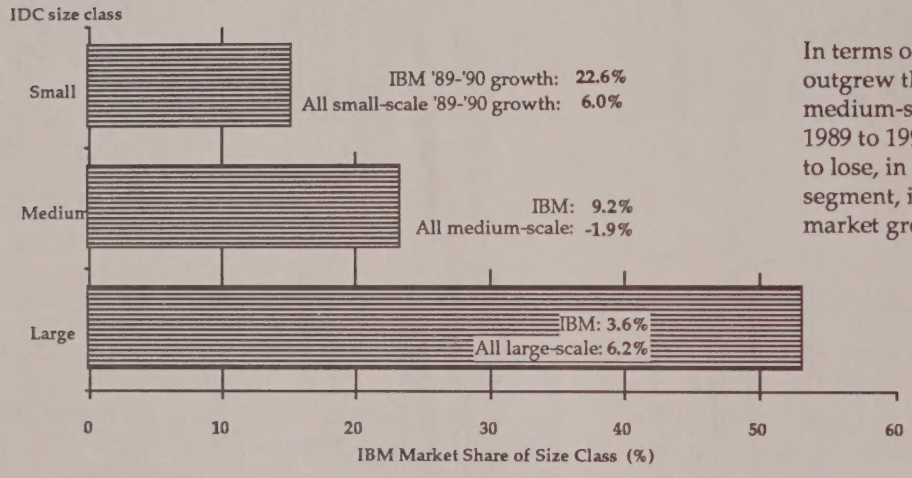
Will the ES/9000 make IBM's 1991 great? Probably not. A smooth rollout (production ramp-up) will save a bad year. A bad rollout will turn 1991 into a disaster.

IDC expects IBM will ship as many 300, but probably closer to 200, new-technology ES/9000s by year's end. IBM hopes it will be able to fill all 900 and most 820 "first day" orders this year. But that's it. Indeed, filling those orders will keep IBM very busy. A very small number of upgrades, and orders for smaller new technology systems, may be filled in 1991. At announcement time last fall IBM executives were dropping hopeful hints that the company would be able to accelerate the delivery schedule. That hasn't happened. In fact, many customers are noting that systems are showing up four to five weeks later than promised.

The new-technology systems total to about $3 billion in new business. Not a bad piece of change. In another year it might be enough to significantly outperform popular expectations. But it's not enough to make but a dent in IBM's 1991 revenue problem. Still, don't count IBM out. It has been known to sandbag shipments to create a huge year-end swell. Not likely this year, but not out of the realm of possibility either.

— with Frank Gens, Technology Investment Strategies Corp.

IBM 1990 Worldwide Market Share ($) by Size Class

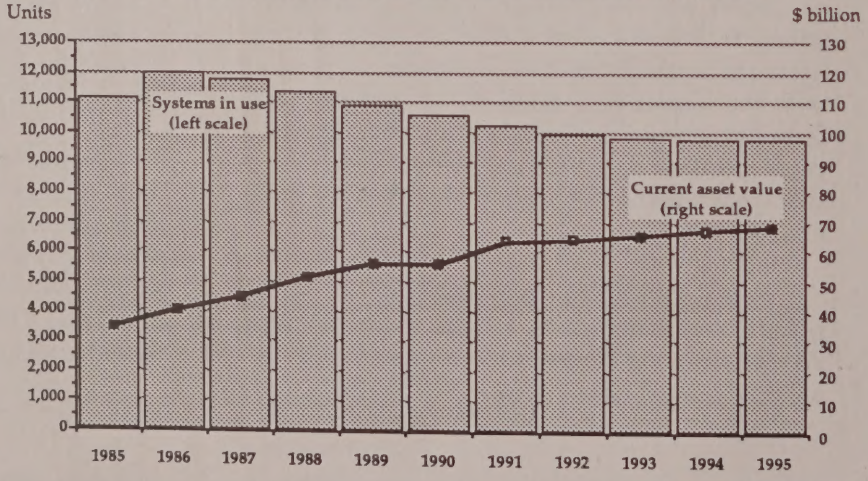


In terms of revenue, IBM outgrew the small-scale and medium-scale segments from 1989 to 1990. Where it had most to lose, in the large-scale segment, it lagged behind overall market growth.

Source: IDC, 1991

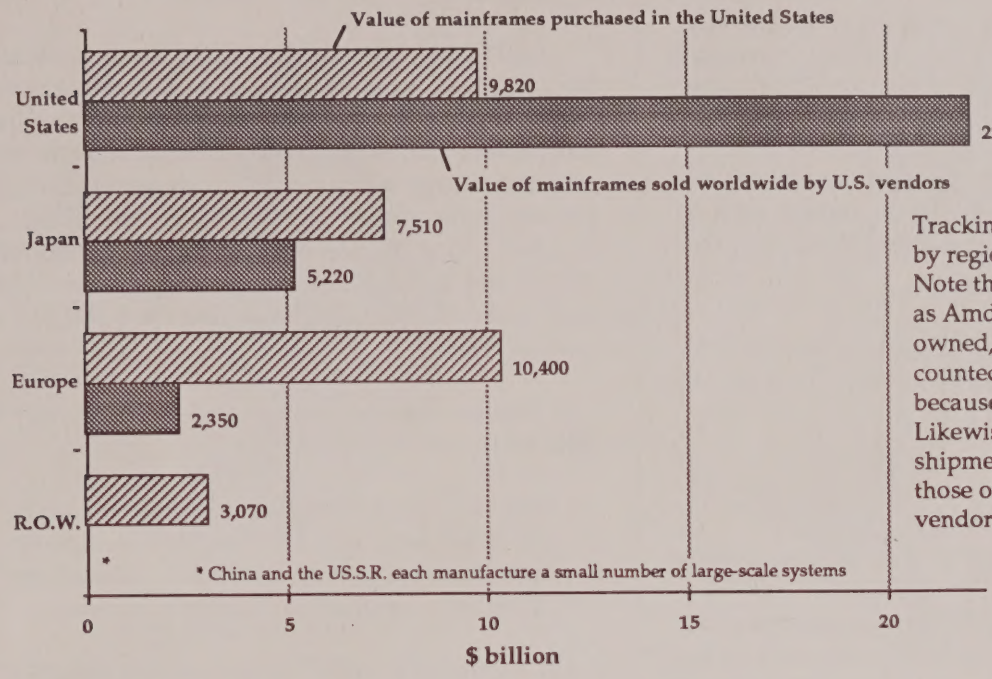
United States Large-Scale System Installed Base and Current Asset Value

The big are getting bigger. Despite the gradual decline in the number of large-scale systems in use, their combined value is still rising (see p.10 for methodology). That means several things: that downsizers are, more typically, small mainframe sites. Or, that the big really are getting bigger, and that consolidation means running applications (that used to run on two, three or four mainframe systems) on one giant.



Source: IDC, 1991

1990 Large-Scale Shipment Value by Vendors' Region and Region of Consumption



Tracking computer shipments by region can be misleading. Note that while companies such as Amdahl are partly Japanese-owned, their shipments are counted in the U.S. figures because Amdahl is U.S.-based. Likewise, ICL's and Bull's shipments are grouped with those of other European vendors.

Source: IDC, 1991

IBM S/370 User Buying Intentions: A Long, Slow March to Summit?

To ascertain the impacts of IBM's ES/9000 and S/370 announcements, a portion of IDC's 1991 Industry Outlook survey was dedicated to IBM S/370 customers' S/390 procurement activities and intentions. Among the many interesting highlights were these three:

- **The role IBM mainframes play at large S/370 sites is not expected to diminish.** Since the inauguration of the S/360 over 27 years ago, IBM's high-end systems have been the general -processing workhorse in most large enterprises. IBM's customers have invested nearly $135 billion in S/370 applications. Approximately 67.9% of IBM's high-end customers believe their IBM mainframe will continue to be their primary general-purpose processor. Another 13.8% see their mainframes evolving into a more specialized role as an OLTP, database or network server. However, a not insignificant 18.4% of IBM's high-end customers either expect the role of their mainframe to diminish, or they aren't sure how it will change. While not alarming, these numbers lend credence to our assertions that downsizing is more than just a buzzword at IBM mainframe sites.

- **Near-term demand for ES/9000 systems is under pressure.** In 1990, 20.0% of respondents purchased a 3090-class machine, and 10.9% purchased 3090 upgrades. In contrast, only 15.3% of IBM's mainframe customers expect to purchase a ES/9000 system in 1991; overwhelmingly they will purchase. Of those intending to buy, 54.5% will purchase a 9021 water-cooled model, the balance choosing air-cooled machines. The ES/9000s most important competition is older IBM systems. Approximately 22% of sites will buy ES/3090s, but not from IBM. About 30% will approach IBM about a 3090; 51% will deal with either a leasing company, or a used-equipment dealer.

- **S/390 features are not grabbing customers.** At first glance, IBM's customers don't seem overly enthusiastic about the new S/390 features. Only PR/SM, IBM's solution for logical partitioning, rated a "very important" ranking. Other key S/390 features, including IBM's fiber-optic channel feature (ESCON), the improved-availability feature called dynamic relocation, the CPU clustering known as Sysplex, and the integrated cryptographic facility received low level of interest.

In the supercomputer realm, growth slightly rebounded to 9.9%. Cray Research is experiencing the pain of a major corporate transition. Additionally, competition in the market is becoming increasingly intense as both Japanese and minisupercomputer vendors encroach upon Cray's long-time turf.

Digital and Tandem both gained market share in their first full years of competing. Digital's VAX 9000 machines contributed $420 million; Tandem's Cyclones added $200 million.

DASD sales were very strong, especially for IBM. The large-system storage market grew 9% in 1990, to $9.2 billion worldwide.

Discounting Dilemma

In an apparent attempt to exert pricing leadership, after introducing the J models in October 1989, IBM rolled fourth quarter 1989 discounts back to the 10% range from 15%. However, because of speculation surrounding the then-upcoming Summit announcement, the market didn't follow IBM's directives. By the end of last year's first quarter IBM had begun offering discounts on 600J-class machines to large customers in the vicinity of 30%. Before the September introduction of the ES/9000 machines, IBM discounts reached 35%; Amdahl discounts reached 45%.

Last September, both IBM and Amdahl indicated their intention to once again make list prices meaningful by minimizing the use of discounting as a competitive hammer. However, severe discounting continues: large customers continue to demand, and get, discounts in the vicinities of 25% from IBM, and 35% from Amdahl. The effective result of the pricing environment is that customers can purchase a new high-end system from IBM at half the $/MIPS they paid in 1988.

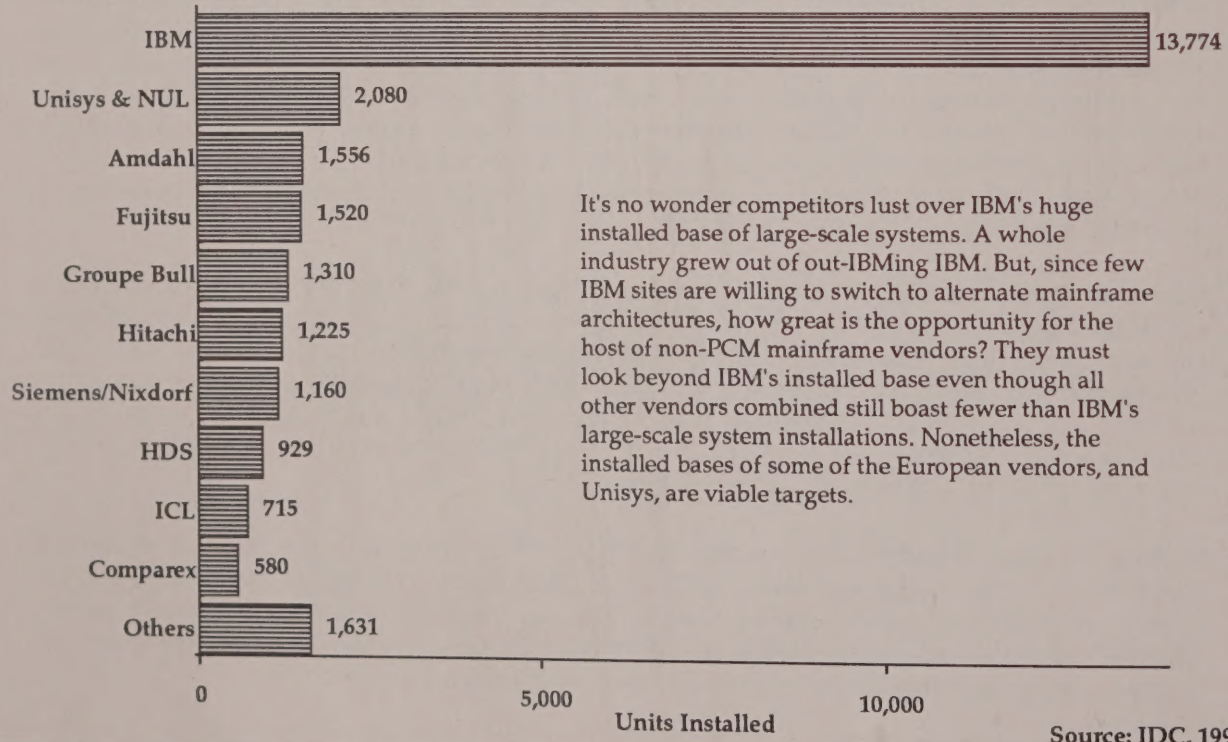
Extreme discounting has had three primary effects on the marketplace:

- Because discounting was heaviest on high-end machines, it fueled the drive to consolidate data processing resources; mainframe MIPS were cheapest on biggest machines.

- It accelerated the collapsing of the effective field of players. Unisys, Bull, and CDC, had neither the technology nor financial resources to keep pace. Only IBM and Japanese or Japanese-financed/supplied vendors, with their deep pockets, technical expertise, and com-

(continued next page)

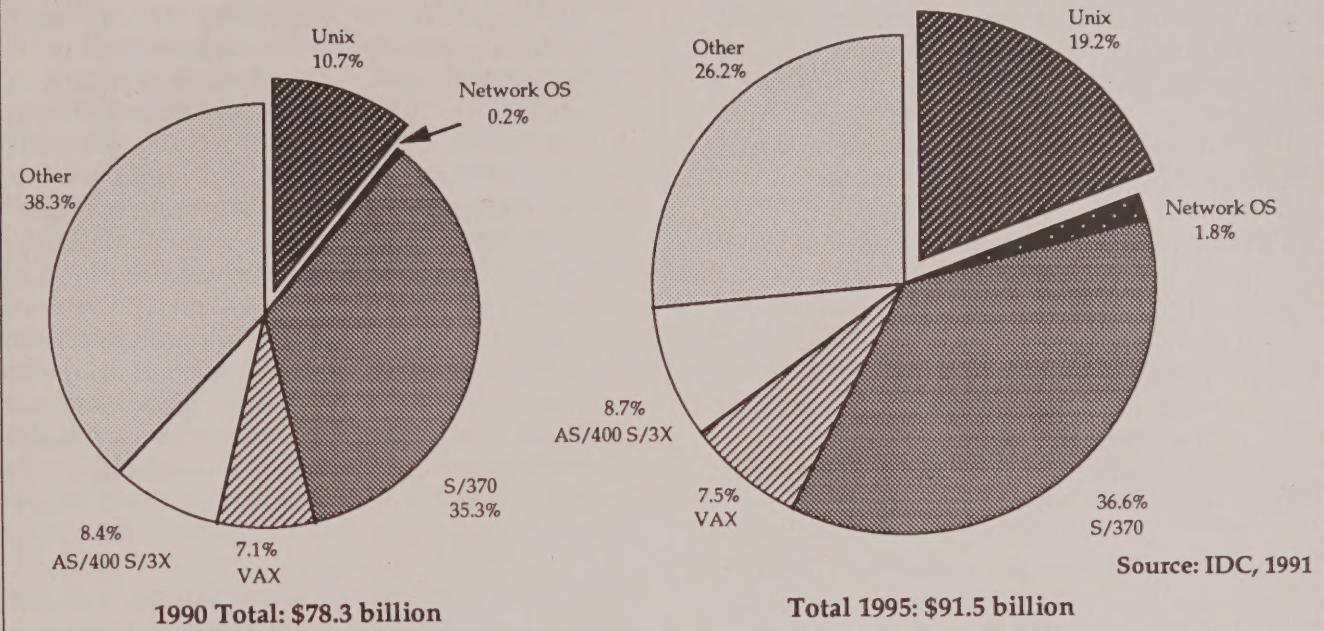
Long Way Up: Worldwide Large-Scale System 1990 Installed Base by Vendor



It's no wonder competitors lust over IBM's huge installed base of large-scale systems. A whole industry grew out of out-IBMing IBM. But, since few IBM sites are willing to switch to alternate mainframe architectures, how great is the opportunity for the host of non-PCM mainframe vendors? They must look beyond IBM's installed base even though all other vendors combined still boast fewer than IBM's large-scale system installations. Nonetheless, the installed bases of some of the European vendors, and Unisys, are viable targets.

Source: IDC, 1991

Worldwide Multiuser System Hardware Sales by Operating System



mitment, were able to maintain or improve their worldwide competitive standing.

- It began forcing a major restructuring of the secondary market for mainframe equipment. The volatile pricing on newer equipment depressed the value of older equipment more rapidly than expected by many leasing houses. Failures, mergers, and a huge increase in the market share of IBM Credit Corporation (ICC) have been the result.

Players and Upstarts

Amdahl experienced a poor 1990, losing market share to a surging HDS. Its outlook is darkened by the heavy discounting, and by IBM's increasing willingness to sell used (old IBM Credit Corp.) systems to maintain account control. WIth continued discounting likely, Amdahl's 1991 performance will probably mirror IBM's. One interesting differentiator is Amdahl's UTS: native Unix on a PCM machine (not just Amdahls). Amdahl has met with reasonable success selling Unix in France and in Spain, where a significant proportion of Fujitsu mainframes run UTS.

Under the wing of National Semiconductor, HDS (then National Advanced Systems) seemed headed for a crash. The 1989 transaction that landed HDS in the combined hands of Hitachi and EDS has led to a phenomenal resurgence of the company. Behind committed financial backing, a sound management team, and a guaranteed pipeline to new technology, HDS once again became viable in the market's eyes. HDS's fortunes should continue to improve, spurred by the company's new "Andromeda" series of machines.

Although still not major forces in the day-to-day workings of the market, the arrival of Tandem and Digital to the mainframe space heralds further changes in competitive practices and market shares. Digital is augmenting its customer demand for increased application scalability with major thrusts into the transaction processing market. The company enjoyed notable commercial market success in 1990, shipping 70% of its VAX 9000 systems to commercial sites. Moreover, DEC claims that 30% of its VAX mainframes were part of deals with new customers.

Like Digital, Tandem is attempting to exploit the high cost of S/370-based transaction processing solutions with its Cyclone mainframe. But unlike Digital, Tandem can not leverage a huge installed base as it works to enter the market. Tandem's strategy is to become the database engine in large commercial installations. It has invested heavily in its SNA-compatible communications products to provide greater IBM mainframe affinity. However, Tandem must improve its application development and system administration tools, channels and integration partnerships, and service offerings to drive greater growth.

— with Peter Burris and Stephen Josselyn

Building Consistent, Yet Flexible, Fences: IDC's Size Classification Criteria

Few definitions in as dynamic a field as the computer industry can be more than general guidelines. Consider the elasticity of terms like mainframe or supercomputer. When IDC classifies systems in size classes, it attempts to adhere to certain criteria, among which it is important to note the following:

- Probably the most important element of the definitions is the identification of a size class which includes certain representative systems (e.g., IBM's 3090 series for large-scale, and the upper ranges of Digital's VAX series for medium-scale) "and their competitors." That is, the primary competitive role for which a system is marketed, or at least accepted by the market in the majority of cases, is critical.

- The most important aspects of any system that contribute to our classification of it within a size class are therefore those establishing its primary competitive role. Average system price, for example, is more important than performance or average number of users.

- While average system price is one of the most important guidelines, it is often modified to group a product family together in one size class. This is justified by the primary role guideline. Thus the primary role for the high end of a supermini line, even if it surpasses the $1 million mark that we cite as the general boundary between medium- and large-scale systems, has typically been to offer higher performance for applications running on a vendor's midrange systems, and is therefore typically counted in our medium-scale category.

- IDC appreciates that performance gains will increasingly come through multiprocessor systems that can be upgraded in the field by adding more CPUs. Because of the intimate tie between the uniprocessor model and higher-performance and higher-priced multiprocessor versions, and to avoid circumstances where a system in the installed base could change IDC size classes from one year to the next, our rule of thumb is that multiprocessor models are counted in the same size class as the uniprocessor.

- System form factor also plays a role in size class determination, particularly in the midrange. Generally speaking, for commercial configurations desktop boxes or deskside towers are considered small-scale, while rack-mountable or large filing cabinet-sized packages are considered medium-scale. Systems requiring raised-floor or other special environments are considered large-scale, but historically, not all large-scale systems have required special cooling contrivances.

These guidelines apply at all levels of IDC research. For example, 386-based personal computers running Unix to service a number of users at dumb terminals exist in great numbers as inexpensive multiuser configurations, but are not counted in our multiuser census because the primary role of these models continues to be as single-user computers.

In assigning models to size classes, IDC takes each case individually, while remaining aware that any standards must be applied uniformly. In all cases, our dialogue with the vendors concerned will remain open to the weight of evidence about a system's primary role. Our only objectives are accuracy, consistency, and equity. Moreover, our guidelines pertain only to what IDC believes to be the primary use of specific models, not the exclusive use to which customers can put them or for which their manufacturers can sell them. Following are IDC's size class definitions:

Systems include CPU(s) and basic peripherals (e.g. data storage devices, terminals, and printers) Multiprocessor configurations are counted as single systems.

Multiuser systems comprise all large-, medium- and small-scale systems, and all computer systems except personal computers and workstations.

Midrange systems comprise all medium- and small-scale systems.

Large-scale systems are either large general-purpose or high-speed scientific computers with average system values generally in excess of $1 million. Representative systems include IBM's 308X, 3090, and water-cooled 390 series and their competitors, as well as so-called supercomputers. Currently shipping models in this category generally support over 128 users in a commercial environment.

Medium-scale systems, which include tradi-

tional supermini-class computers and some systems classified by their vendors as small mainframes, generally have average system prices ranging from $100,000 to $1 million. Currently shipping models in this category support from about 33 to 128 users in a commercial environment. Representative systems include IBM's 43XXs, 9370s, System/38s, larger AS/400s, and air-cooled 390s, the upper ranges of Digital's VAX series (including all 8000s and 6000s), and their competitors. Medium-scale systems are typically packaged in large file cabinet-sized or rack-mountable configurations.

Small-scale systems range from $10,000 to $100,000. Currently shipping models usually support 2 to 32 users in a commercial environment. Small-scale systems are also commonly used in automation, control, and communications processing environments, and increasingly as network servers. Representative systems include lower-range VAX systems from Digital (including all non-workstation MicroVAXs); from IBM, the Series/1, System/36, smaller AS/400 models, and server/multiuser configurations of the RS/6000; and low-end multiuser microprocessor-based systems from Altos, NCR, et al. High-end commodity-chip models specifically designed to function as multiuser systems or servers are counted as small-scale systems, even if manufactured by vendors typically associated with the PC or workstation market (e.g., the Compaq Systempro or Sun Sparcserver).

Shipments are systems delivered for remuneration by the vendor to end users or OEMs, VARs, or other resellers such as leasing companies. Systems used internally are not counted. In the census, unit shipments connote the net difference year-to-year in the installed base.

Installed base for a given year is the previous year's total of systems in use external to the vendor, plus new shipments (including upgrades from other models), minus retirements.

Value of shipments is the value of processors and peripherals (including add-ons) shipped. Dollar values for a current or past year are in that year's valuation of the dollar by inflation and exchange rates; projected dollar values are in dollars at the time of projection, without additional assumptions about future inflation and exchange rates.

Current asset value (CAV) represents the value of the installed base as a function of new shipments, retirements, and asset depreciation weighed against original model-level ASVs. As a research category it replaces "value of the installed base."

A Note on Worldwide Markets

Readers may at first be surprised at the size of the markets outside the United States. Note that while IDC forecasts in constant dollars, our historical data are in the dollars of that given year. As the last five years have shown an overall weakening of the dollar, U.S. markets tend to look smaller than their international counterparts.

Another factor in what may seem to be an inflated non-U.S. market is the tendency in Japan for software to be bundled with hardware. This makes for a higher average system value on an apples-to-apples, MIPS-to-MIPS, 3090-to-M780 basis.

Moreover, shipments are defined as the difference in the installed base. Thus if one 3090-180 were upgraded to a 200 in 1989, and one 3090-200 to a 400, only the 400 upgrade would appear as a shipment, since there would have been no change in the installed base of 200s.

Much of the data in this report has been culled from IDC's annual *Processor Data Book*. It presents worldwide multiuser system growth and market shares in a far greater degree of granularity than shown here. In addition, worldwide multiuser data, including the regional sales of all vendors, will follow. For an even broader perspective, IDC's worldwide research operations are teaming up on the report, *Worldwide Information Technology Spending Patterns, 1990-1995*, which covers the entire IT industry (hardware, software, data communications, and services) by 30 countries.

Computer Industry News ... Computer Industry News ... Computer Industry News

Digital Equipment continues to purchase companies that used to play a major role in the European computer business. On the heels of its December purchase of Mannesman-Kienzle, Digital will purchase the largely unprofitable Information Systems Division of Phillips Electronics, N.V. Phillips ISD had annual revenue of approximately $1 billion in 1990 but had been cited as the largest single loss center within Phillips. The sale doesn't include Phillips' PC group. The European Commission is expected to review the bid.

JWP Inc. completed its tender offer for Businessland, and now only has to shut 30 old Businessland offices, and lay off 20% of its workforce. Then JWP must present a single, cohesive message to the largest corporate clients in a distribution market where margins are slimmer and competition is keener than ever. Even before the Businessland deal was complete JWP was showing signs of feeling the tight PC market in the northeast United States (where it was strong due to the Neeco purchase in 1990).

A reorganization at IBM firmed control of PCs, workstations and AS/400s under Jack Keuhler while Terry Lautenbach continues to head the big-iron systems groups. Both report directly to CEO John Akers. Previously, Lautenbach had reported to Keuhler. Meanwhile, glasnost among the rank and file at IBM has come and gone. An electronic bulletin board which was set up to promote forthright discussion of IBM management, strategy and direction, lasted about a week before the plug was pulled. Apparently the system had been heavily used, but there was no word on possible successors.

United States Federal District Court Judge Harold Greene gave way to A U.S. Court of Appeals ruling and lifted the ban preventing regional Bell telephone operating companies (RBOCs) from providing information services. Nothing will happen quickly. The decision will go through an appeals process; some RBOCs may debut new services within a year.

Sun flies high while others crash and burn. It reported a 35% jump in its fiscal fourth-quarter income, due to higher sales and margins.

Siemens-Nixdorf will lay off 3,000 by yearend, the result of consolidation and cost-cutting resulting from last year's merger..

Storage Tech agreed to acquire IBM AS/400 distributor XL/Datacomp for about $150 million.

Data General returned to its office automation (OA) roots with the announcement of new 88100-based servers and workstations and host- and LAN-based office software based on Uniplex, LAN Manager and Portable Netware. The aggressively-priced Unix servers are well positioned to compete with Unix PCs or PC servers. Using VARs to penetrate vertical markets, and direct sales to sell OA and RDBMSs into major accounts and government, is the strategy that made DG successful in the early and middle 1980s. Now DG is hoping that aggressively priced AViiONS will allow it to reap higher margins on LANs and software.

Tariffs on imports of laptops from Japan to the U.S. have been lifted but will, most likely, be replaced by a duty on active matrix flat panel displays. The laptop tariff will likely benefit vendors like Casio, Citizen, Fujitsu, and Hitachi, while the panel duty may drive remaining laptop and notebook manufacturing offshore.

Bolt, Beranek & Newman has discontinued development on its next-generation parallel processing system and has folded its supercomputer unit into other BB&N divisions after failing to acquire outside funding. As noted, the fledgling parallel processor computer market is still tiny — about $150 million last year, and competition is tight.

Midrange Review and Forecast

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Unix, RISC, Servers Bright Spots in Gloomy But Still Big Midrange

Midrange eulogies — somber and ubiquitous — are yesterday's news. They're premature, too: the midrange is $47 billion big. That's size enough to warrant the scrutiny of the largest industry giants and the smallest startups. So, what's happening in the midrange? We identify four trends which continue to shape competition:

- **Networked PCs.** PCs and LANs continue to eat away at low-end multiuser system sales. Since 1987, the under-$40,000 segment of small-scale systems has shrunken by one-half; those sales are largely going to networked PCs. While the impact of PC server introduction from Compaq, Dell and NetFRAME was not as huge as some expected, channel sophistication and LAN applications are expected to grow to fill the void in the coming years.

- **Multiprocessing CISC systems.** Several midrange vendors introduced systems based on combinations of CISC processors. These multiprocessor systems increase overall functionality by a factor of two, three or four. But achieving a smooth transition from older proprietary systems to the new systems is the challenge. Perhaps more importantly, multiprocessors' viability is being brought into question. Case in point: Sequent. It has prospered for three years but now seems to have just about hit the wall. As a whole, multiprocessor Intel systems accounted for just under 3% of U.S. small-scale shipments in 1990.

- **RISC systems.** Can multiprocessor CISC-based systems keep up with RISC? RISC systems and workstation server configurations, from Sun, HP and IBM, among others, are redrawing competitive benchmark battle lines. RISC-based systems that offer several times the power of CISC-based systems are widely seen as the future of the midrange. RISC-based small system shipments made up under 15% of the U.S. total, for about 13% of the value of shipments.

- **The mainframe lid.** Conventional wisdom holds that one way out of a stagnant market is through the high end. Not in the midrange. IBM has effectively firewalled its installed base of large-scale systems with the S/390. Competition to sell to the remaining mainframe customers is intense, dominated by established mainframe vendors. Most notably, both Tandem and Digital have had a hard time cracking the mainframe ceiling.

The data on the following pages identifies midrange bright spots and black holes. While midrange revenues are not growing — they are and will remain flat — there is a midrange opportunity. Vendors that can negotiate their way through — selling Unix and RISC systems, or holding on to loyal customer bases — stand to increase their portion of the midrange pie. At $47 billion, that's the good news. For proprietary CISC-based system vendors the down side is obvious: vendors with lower cost structures are circling like sharks in bloody water. This will be nothing if not exciting.

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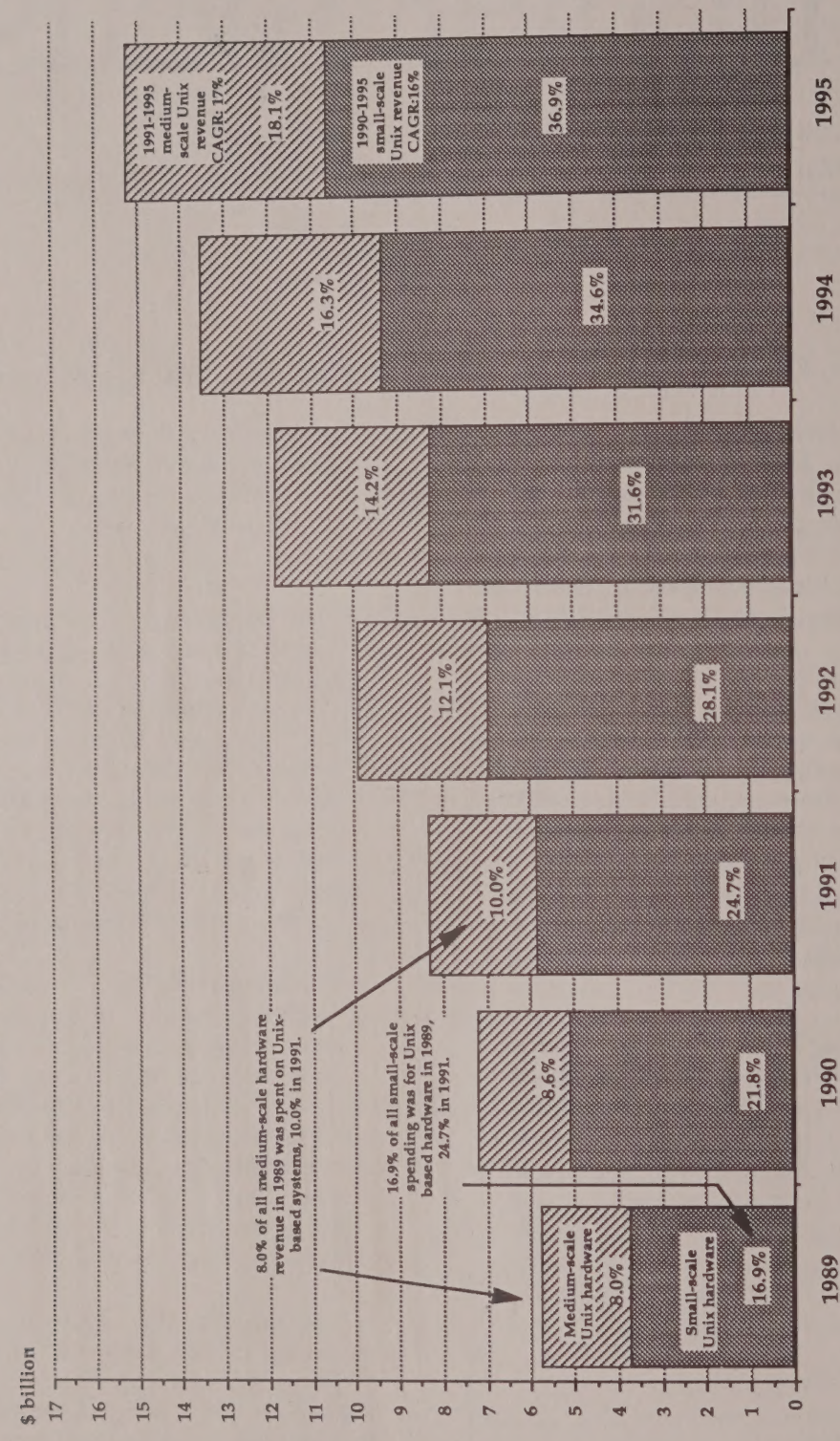

Small- and medium-scale Unix growth will outpace overall midrange growth for the forseeable future (contrast the growth data on this page with the tables on pages 4 and 5). As a result Unix will comprise a growing portion of all midrange hardware revenue, eventually reaching as much as 18% of the medium-scale market and 36% of the small-scale markets in 1995. The challenge for non-Unix vendors: maintain share in a rapidly dwindling market. For Unix vendors: develop, differentiate, distribute. Source: IDC, 1991.

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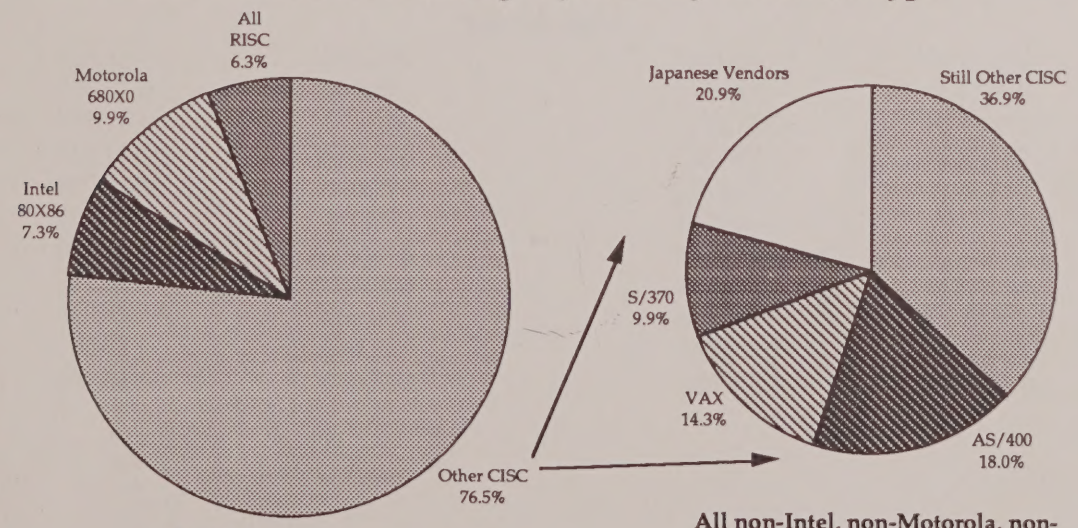
1990 Top 20 Worldwide Midrange System Vendors
(Value of shipments, $ million)

	1990 Midrange	1990 % Share	'89-90 % Growth
IBM	9,310	19.5	13.9
Digital	5,430	11.4	1.1
Fujitsu	2,690	5.6	3.5
NEC	2,620	5.5	2.3
Unisys & NUL	2,220	4.6	-7.3
Siemens-Nixdorf	1,560	3.3	-5.4
Groupe Bull	1,360	2.8	-8.7
Hewlett-Packard	1,350	2.8	25.9
Hitachi	1,300	2.7	-5.8
Toshiba	1,080	2.3	5.9
Tandem	980	2.1	0.0
NCR	970	2.0	-10.2
Wang	790	1.6	-20.6
ICL	580	1.2	-52.6
AT&T	525	1.1	0.9
Data General	520	1.1	-48.1
Sun Microsystems	510	1.1	628.6
Prime	500	1.0	-16.7
Mitsubishi	480	1.0	11.6
Olivetti	390	0.8	-28.3
Others	12,665	26.5	-1.2
Total	47,830	100.0	1.7

Source: IDC, 1991

1990 Worldwide Midrange Systems by Processor Type



All midrange systems: $47.8 billion in 1990

All non-Intel, non-Motorola, non-RISC, midrange systems: $36.6 billion in 1990

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Medium-Scale Systems Market

	Number of Systems Shipped	Cumulative Number in Use	Value ($ million) Shipped
	United States		
1985	25,840	128,970	8,690
1986	20,120	140,330	8,310
1987	20,130	150,640	8,430
1988	21,390	157,690	8,030
1898	16,690	154,170	7,580
1990	**14,930**	**146,320**	**7,120**
1991	14,500	144,000	6,700
1992	14,500	143,000	6,500
1993	14,000	138,000	6,400
1994	14,000	132,000	6,300
1995	13,500	125,000	6,200
	Outside of the United States		
1985	27,760	153,590	9,230
1986	27,130	170,190	11,530
1987	31,420	192,770	13,510
1988	36,890	212,970	15,490
1898	41,170	231,240	17,700
1990	**39,830**	**248,700**	**17,670**
1991	38,700	268,000	17,500
1992	40,500	268,000	18,200
1993	42,000	298,000	18,800
1994	43,000	311,000	19,100
1995	44,000	322,000	19,400
	Worldwide		
1985	53,700	282,560	17,920
1986	47,250	311,240	19,840
1987	51,550	343,410	21,940
1988	58,280	370,260	23,520
1989	57,860	385,410	25,280
1990	**54,760**	**395,020**	**24,790**
1991	53,200	412,000	24,200
1992	55,000	428,000	24,700
1993	56,000	436,000	25,200
1994	57,000	443,000	25,400
1995	57,500	447,000	25,600

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Small-Scale Systems Market

	Number of Systems Shipped	Cumulative Number in Use	Value ($ million) Shipped
	United States		
1985	220,480	1,245,070	7,185
1986	200,400	1,326,170	7,510
1987	176,080	1,371,170	7,850
1988	184,200	1,443,370	7,900
1989	136,590	1,439,410	7,950
1990	**142,010**	**1,419,400**	**8,200**
1991	150,500	1,416,000	8,250
1992	163,500	1,386,000	8,250
1993	189,000	1,378,000	8,650
1994	208,000	1,392,000	8,650
1995	217,000	1,424,000	8,750
	Outside of the United States		
1985	302,320	1,425,120	7,495
1986	339,020	1,656,760	9,490
1987	382,890	1,891,710	11,980
1988	448,860	2,206,890	13,770
1989	435,130	2,482,930	13,780
1990	**460,410**	**2,757,000**	**14,850**
1991	486,500	3,011,000	15,350
1992	525,000	3,308,000	16,300
1993	590,000	3,614,000	17,350
1994	680,000	3,935,000	18,350
1995	735,000	4,306,000	19,900
	Worldwide		
1985	522,800	2,670,190	14,680
1986	539,420	2,982,930	17,000
1987	559,060	3,262,880	19,830
1988	633,060	3,650,260	21,670
1989	571,720	3,922,320	21,730
1990	**602,420**	**4,176,400**	**23,040**
1991	637,000	4,427,000	23,600
1992	688,500	4,694,000	24,550
1993	779,000	4,992,000	26,000
1994	888,000	5,345,000	27,000
1995	952,000	5,730,000	28,650

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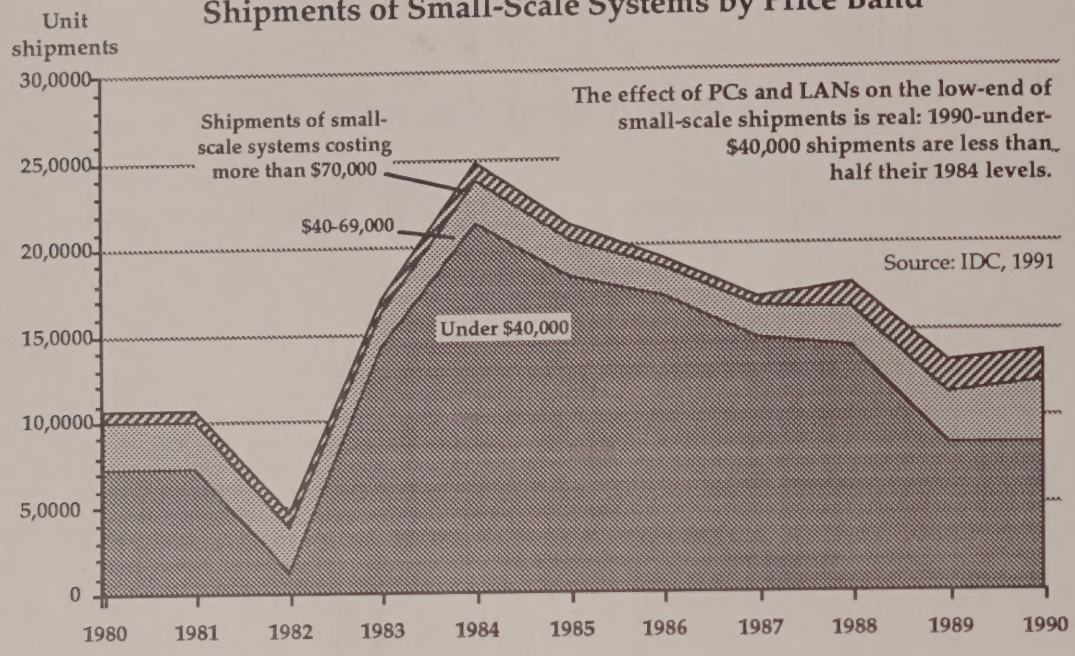


Midrange Survival: Some Closed, Some Open, Some of Both

Who's winning in the midrange? IBM has been gaining share at the expense of Unisys and Digital. Hewlett-Packard also. Japanese suppliers have been coming on strong, but their dominance in the various Top 15s is heavily skewed by their Japanese business. Sun Microsystems made a dramatic debut in small-scale systems; similarly, Compaq makes its first appearance via the Systempro. A rundown on the 1990 midrange leaders:

- IBM shook up the midrange market with two product announcements in 1990 that will be competitive in 1991 and beyond. The RISC RS/6000 added nearly $400 million of revenue to IBM's small-scale business. It did not affect sales of AS/400s, which continued strong, although as the RISC family expands, it will pressure IBM's commercial midrange more. The airframe ES/9000s may be attractive to customers "upgrading" down from larger systems. They, as well as offerings of the PCMs, will continue to wall out midrange systems from the data center.

- Digital continues to experience a nearly month-by-month increase in ASVs for its VAX 4000 and 6000 models. But the increases are not enough to offset sagging shipments. As a result Digital continues to lose share. DEC's Alpha project will be moderately successful, preventing much of an erosion of DEC's commercial base (which exhibits considerable interest in Unix) but will not save DEC's technical VAX business.

- Hewlett-Packard overhauled its entire midrange product line, and has successfully made the transition to highly upgradable RISC systems. HP's economies-of-scale strategy (similar hardware architecture, different operating systems) is paying off: its MPE business outperformed the market, and its Unix midrange offerings grew over 50%.

- NCR made what it called its biggest product introduction ever — a scalable series of systems based on multiple Intel microprocessors and on running Unix up and down the line and DOS, OS/2 and Netware at the low end. The line was topped in 1991 by Teradata's loosely-coupled parallel processing technology that NCR hopes to sell as standalone engines for massive database queries.

- Sun blew into the midrange with nearly $500 million in server sales. Sun faces tougher going as it tries to leverage its networked desktops into more commercial applications while watching IBM over its shoulder in its home technical markets.

Opportunities in the Midrange

Where is the multiuser hardware opportunity in this swiftly moving — if not swiftly growing — market? From recent user research IDC has uncovered three behavior patterns and interest areas across different customer bases: downsizing, client/server interest, and unix-based open systems interest.

Users of mainframes from suppliers other than IBM are actively downsizing their appplications off of mainframes, and on to Unix. Most are less active in pursuing client/server strategies, so traditional host-based solutions should continue to have success here. Many multiuser Unix sites have already downsized via Unix, and a small but aggressive subsegment is pursuing client/server applications.

While there may be some opportunity for midrange systems to consolidate groups of smaller systems, a bias toward centralization is apparent at VAX and AS/400 sites. Given DEC's strong VAX 9000 offering and IBM's customer loyalty and AS/400 might, there is little room here for suppliers other than Digital or IBM.

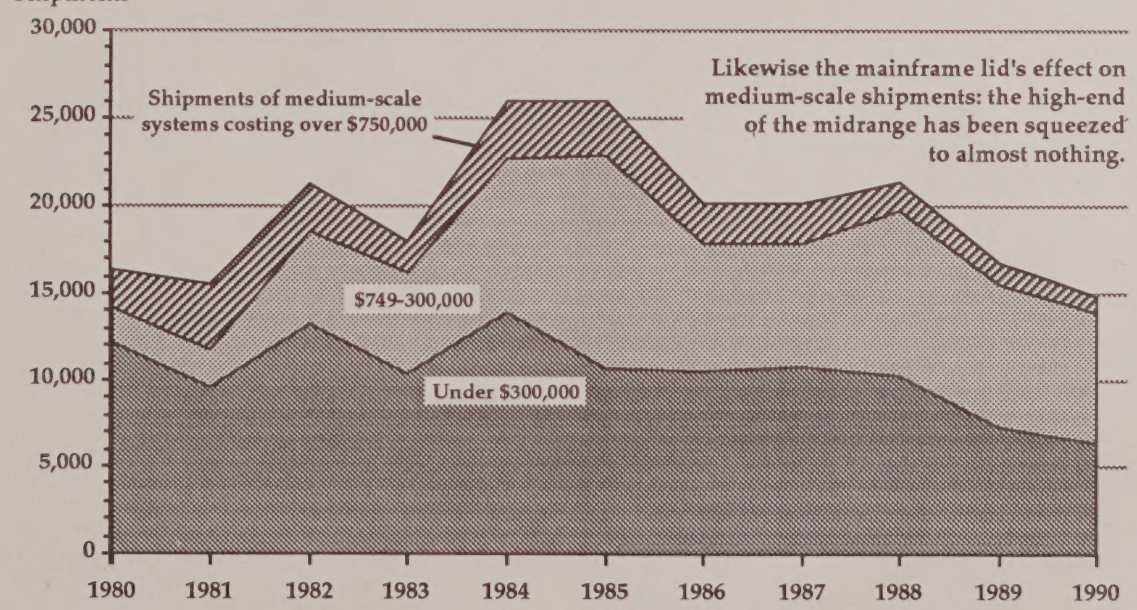
However, other VAX sites also showed a strong inclination to decentralize, and VAX sites in general are more open than average to Unix. Unix-based smaller systems may compete here and at IBM mainframe sites, which also displayed these tendencies.

IBM mainframe sites are moving gradually toward a client/server orientation, and they are prepared to buy a lot of servers. However, the bulk of their short-term buying will consist of low-cost Intel-based systems, or of taking existing systems and converting them to servers. We believe this base has not given up on OS/2.

VAX sites have a strong interest in client/server solutions and are open to Unix. Most existing Unix sites are fairly conservative about servers, but a leading-edge minority are, in fact, the most aggressive pursuers relative to the other environments.

We estimate that mini makers have a one to two year window to try selling low-end LAN servers through VARs and direct sales and educating a largely ignorant LAN user base on the strengths of centralized data and systems management. By then, the PC channel may have figured out how to sell complex systems, or systems integrators and VARs will have moved overwhelmingly to hardware using PC-like cost structures and distribution.

Shipments of Medium-Scale Systems by Price Band



Source: IDC, 1991

To Our Readers

This issue of the *Gray Sheet* inaugurates a new feature: Page Eight, a forum for forward-looking analysis. Page Eight is more than just a logical extension to the *Gray Sheet*. It's where readers can get a step closer to IDC's braintrust. It's a chance for IDC to bring to you that which IDC is uniquely qualified to deliver: market data and forecasts, along with questions like "But what does this *really* mean for the computer industry in five years." Here goes:

Despite trade press reports to the contrary, the midrange is teeming. That's an understatement. The data in these pages paints a fabulously complex picture of a market in great flux. It also poses numerous and significant challenges to midrange computer vendors. These include product-technology issues (to transition to RISC, and if so, how) and product-position issues (servers or systems? Or both? Or, is there any difference?). There are a host of other questions: How can old-line CISC vendors continue milking end-of-the-line proprietary systems while announcing barnburner new technology? How can stuck-in-the-mud Motorola parlay its market share lead over Intel into perceived momentum? When will RISC dominate? Maybe just: Will RISC dominate?

More fundamental questions remain unasked: How many vendors can the open, standards-based midrange support? How will midrange systems be sold in five years? How will the industry push expertise out the dealer channel to users? Are direct sales too expensive, even for half-million-dollar systems? Can PC superstores sell mainframe power in a PC box?

The *Gray Sheet* expects that the steady march of technological substitution may provide the basis for answering these questions. Consider this scenario: low-cost microprocessors and the allure of industry-standard software architectures compel users to demand "openness" from their systems suppliers. Most suppliers comply. Users assume the risk inherent in such solutions. Competition around difficult-to-differentiate hardware platforms becomes exceptionally bloody, based primarily on price. Margins go to hell, and suppliers can't support the sophisticated systems they sell. Users end up unable to efficiently or successfully operate their systems. A macabre subindustry develops to rescue users from midrange nightmares.

The few big, old-line vendors that managed to make the costs of switching to low-cost microprocessors so excessive that a good portion of their installed bases didn't switch end up heroes. Their customers end up the lucky ones. Sure they pay a little more, but their exposure is reduced. Open systems is simple risk management (high risk, low price or low risk, high price) and everything is "open."

Likely? Possible? You bet. Like every other computer market there's more to the midrange than technology. Answers to the really pressing questions are still in short supply. That may bode well for old-line midrange suppliers. As always, we invite your comments on what you read here, and throughout the *Gray Sheet*.

Respectfully,

Doug McL

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